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THE NEW ZEALAND WAR OF 1863-64-65.

SPECIAL REPORT

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ON

WOUNDS AND INJURIES RECEIVED IN BATTLE.

Extracted from the Medical and Surgical History of the New Zealand War.

BY

INSPECTOR-GENERAL MOUAT, V.C., C.B.





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By Inspector-General MOUNT, V.C., C.B.

THE different kinds of injuries received in battle have not differed from those usually received in combats between civilized armies, with the exception of the absence of destructive injuries, such as are inflicted by round shot. The Maori inhabitants of New Zealand use firearms for distant fighting, tomahawks and spears for close combat. During the war, the chief actions were those in which our troops stormed the native "pahs," which were elaborately constructed earthworks, stockaded and provided with sheltered recesses, to which the garrison retired during hot fire. In the assaults made on the pahs, the Maoris remained in their trenches, firing only when the assailants were close to them; and as very many of them were armed with double-barrelled guns, it commonly happened that the foremost of our men were killed outright. It may be remarked that there were very few incised wounds received; the reason of this was that the men were generally slain outright, when near enough to be reached by a tomahawk. Some soldiers were injured by fragments of our own shells, and not a few were wounded accidentally by their comrades, or by their own carelessness, during the campaign.

DEATHS ON THE FIELD OF BATTLE.

It has not been found practicable in this war to ascertain with accuracy the precise injuries which occasioned death on the field of battle in all cases, and it may be remarked *en passant*, it is not likely after an action anywhere the medical officers will have either time or inclination to examine the bodies of the fallen men for the purpose of making investigation into the causes of death; their duties to the living preclude this. In 118 cases, however, the wounds which caused death on the field have been accurately ascertained, and they are noted in the following Table, which may be useful to compare with other similar Tables.

Region of Body wounded in Men killed outright on the Field of Battle.	Number of Cases.	Proportion of cases of each Region, per cent.	Remarks.
Head	40	33·90	In many cases more than one wound was received, that likely to cause death immediately only has been noted.
Neck	4	3·39	
Chest	59	50·00	
Abdomen	11	9·32	
Thigh	4	3·39	
Total	118	100·	

[NOTE.—I am indebted to Surgeon Major Home for valuable assistance in drawing up this report, and in the compilation of the Tables.—J. M.]

NON-COMMISSIONED OFFICERS AND MEN.

CLASSIFIED RETURN of Gun-shot Wounds and Injuries received during the War in New Zealand, from May 1863 to June 1865.

	Region of the Body Wounded or Injured.	Number of Cases.		Amputations.		Excisions.		Other Operations.		Discharged to Duty.	Transferred to		Remaining.
		Primary.	Secondary.	Primary.	Secondary.	Primary.	Secondary.	Bullets Extracted.	Died.		Other Hospitals.	England.	
1. Wounds of the head ..	32	..	..	..	..	..	..	4	..	18	..	.. 3	..
2. Wounds of the face ..	19	..	..	..	..	..	..	1	9	2	..	.. 3	..
3. Wounds of the neck ..	8	..	..	..	..	..	..	..	..	8	..	.. 5	..
4. Wounds of the chest ..	31	..	..	..	..	..	..	2	..	6	..	.. 2	..
5. Wounds of the abdomen ..	18	..	..	..	..	..	..	1	..	8	..	.. 1	..
6. Wounds of the back ..	22	..	..	..	..	..	..	1	..	1	..	.. 1	..
7. Wounds of the perineum and genital and urinary organs (not being wounds of the peritonæum)	5	..	..	..	..	..	..	..	5	..	..	..	..
8. Wounds of the upper extremities ..	121	..	..	..	..	..	..	..	..	17	..	..	..
		..	..	..	..	..	..	..	..	5	..	..	..
		..	..	..	..	..	..	..	..	2	..	.. 1	..
		..	..	..	..	..	..	..	..	2	..	..	..
		..	..	..	..	..	..	..	..	19	..	.. 2	..
		..	..	..	..	..	..	..	..	41	..	.. 8	..
		..	..	..	..	..	..	..	..	2	..	.. 3	..
		..	..	..	..	..	..	..	..	1	..	.. 3	..
		..	..	..	..	..	..	..	..	2	..	.. 3	..
		..	..	..	..	..	..	..	..	2	..	.. 6	..
		..	..	..	..	..	..	..	..	4	..	.. 1	..
		..	..	..	..	..	..	..	..	9	..	.. 11	..

CLASSIFIED RETURN of Gun-shot Wounds and Injuries—continued.

	Number of Cases.	Region of the Body Wounded or Injured.	Amputations.		Excisions.		Other Operations.	Discharged to Duty.		Transferred to		Remaining.
			Primary.	Secondary.	Primary.	Secondary.	Bullets Extracted.			Other Hospitals.	England.	
9 Wounds of the lower extremities ..	122	Superficial wounds Wounds of muscles Injuries of bones without complete fracture .. Fractures of bones (complete) " Bones of pelvis " Femur " Tibia or fibula " Bones of the foot .. .. .	..	..	..	..	10	20	..	..	9	1
10. Wounds with direct injury of large arteries (not being cases of compound fracture) ..	..	.. .. .	..	..	..	..	3	60	..	..	6	..
10a. Wounds of large veins ..	1	Subclavian vein .. .. .	..	..	..	..	..	3	..	..	..	..
11. Wounds with direct penetration or perforation of large joints	31	Shoulder joint Elbow joint Carpal joint Metacarpal joint, thumb Knee joint Tarsal joint	3	4	1	7	..	1	..	..	8	..
12. Wounds with direct injury of large nerves (not being at the same time cases of compound fracture)	5	Crucial nerve Brachial plexus Median nerve Ulnar nerve .. .. .	..	..	..	..	1	1	..	..	4	..
			..	..	..	..	..	..	..	..	3	..
			..	..	..	..	..	..	..	..	1	..
			..	..	..	..	..	1	..	..	..	..
Total	415		18	7	2	7	43	46	243	1	123	2

NON-COMMISSIONED OFFICERS AND MEN ONLY.

Classified Return of Operations and of Deaths following thereon, between May 1863, and June 1865, at the various Hospitals in New Zealand during the War there.

Nature of Operation.	Operations Performed.		Deaths following Operations.	
	Primary.	Secondary.	Primary.	Secondary.
Amputations—				
Upper Extremities :				
Shoulder Joint .. .. .	..	..	..	..
Arm.. .. .	4	..	1	..
Fore-arm .. .. .	..	3	..	..
Thumbs	2	..	..	..
Fingers	7	..	..	..
Lower Extremities :				
Hip Joint .. .. .	..	..	..	..
Thigh { At Upper Third .. .. .	..	..	..	..
{ Middle	2	..	..	..
{ Lower	1	2	..	2
Leg	2	..	..	..
Ankle Joint .. .. .	..	..	..	..
Medio Tarsus .. .. .	..	..	..	..
Toes.. .. .	..	..	..	..
Excisions, Upper Extremities—				
Head of Humerus	1	7	..	..
Elbow Joint	1	..	..	..
Extraction of Balls, and other Foreign Bodies	27	15	..	..
Ligature of Arteries—				
Common Carotid .. .. .	..	1	..	..
„ Femoral .. .. .	..	1	..	..
Other Operations .. .. .	..	..	..	..
Total	47	29	1	2

OFFICERS.

Classified Return of Gun-shot Wounds and Injuries received in Battle in the New Zealand Campaign. from May 1863 to May 1865.

	Classification.	Regions of the Body Wounded or Injured.	Number of Cases.	Amputation.		Excisions.	Other operations.	Died.	Discharged to Duty.	Transferred to		Remaining.
				Primary.	Secondary.					Other Hos- pitals.	England.	
1	Wounds of the head ..	Wounds of the scalp ..	2	..	..	..	..	1	2	..	..	..
2	Wounds of the face ..	Penetrating wounds with injury of brain ..	1	..	..	..	..	1	..	..	..	..
3	Wounds of the neck ..	Fractures of bones of face ..	1	..	..	..	..	..	1	..	..	..
4	Wounds of the chest ..	Superficial wound of face ..	2	..	..	..	..	..	2	..	..	..
		Wounds of the muscles of the neck ..	2	..	..	..	..	..	1	..	..	..
5	Wounds of the abdomen ..	Wounds of muscles of chest ..	1	..	..	..	..	..	1	..	1	..
		Wounds fracturing bones ..	1	..	..	..	..	2	1	..	..	..
6	Wounds of the back and spine	Wounds penetrating chest and wounding pleura ..	3	..	..	..	..	5	2	..	..	..
8	Wounds of the upper extremities	Wounds penetrating abdomen and wounding viscera ..	2	..	..	..	..	1	3	..	..	..
		Wounds of dorsal muscles ..	1	..	..	..	..	..	4	..	1	..
9	Wounds of the lower extremities	Wounds injuring spine or spinal chords ..	3	..	..	..	..	..	5	..	..	..
		Superficial wounds ..	1	..	..	..	..	..	1	..	..	..
10A	Wounds with injury of large veins ..	Wounds of muscles ..	5	..	..	..	..	..	1	..	..	..
		Injuries of bones without fracture. Tibia ..	1	..	..	..	..	..	1	..	..	..
11 {	Wounds with direct penetration or perforation of large joints ..	Fractures of bones with comminution. Fibula ..	1	..	..	..	..	..	..	..	..	..
		" " " Tibia and Fibula ..	2	..	..	..	..	..	..	..	..	..
11 {	Wounds with direct penetration or perforation of large joints ..	" " " Femur ..	1	..	..	..	..	..	..	..	..	..
		" " " of the foot ..	1	..	..	..	..	..	..	..	..	..
11 {	Wounds with direct penetration or perforation of large joints ..	Femoral vein ..	1	..	..	..	..	..	..	..	..	..
		Shoulder joint ..	1	..	..	..	..	..	..	..	..	..
11 {	Wounds with direct penetration or perforation of large joints ..	Knee joint ..	1	..	..	..	..	..	..	..	..	..
		Total ..	48	..	1	1	..	13	27	..	4	4

OFFICERS.

Classified Return of Operations performed, and of Deaths following thereon, between the 8th day of May, 1863, and the 30th day of December, 1865, at the various Hospitals in the Field, during the campaign in New Zealand.

Nature of Operation.	Operations Performed.		Deaths following Operations.	
	Primary.	Secondary.	Primary.	Secondary.
Amputations—				
Upper Extremities :				
Shoulder Joint
Arm
Forearm
Thumbs
Fingers
Hip Joint
Lower Extremities :				
Thigh, Lower third	1	..	1
Leg
Knee Joint
Ankle Joint
Medio-Tarsus
Tarso-Metatarsus
Toes
Excisions Upper Extremities —				
Shoulder Joint	1	..	..
Extraction of Balls and other Foreign)				
Bodies
Ligature of Arteries
Other Operations
Total	2	..	1

WOUNDS RECEIVED IN BATTLE AND OTHERWISE.

Preliminary Remarks.

Gunshot Wounds.—In the Tables preceding, an accurate classification of the various injuries received by the men and officers during the campaign has been given. In the enumeration I have included wounds received by men by the accidental discharge of fire-arms during their field service; and as the object of a compilation like the present is simply to assist in the accumulation of materials for the elaboration of statistics referring to gunshot injuries, I have included the men of the Colonial forces wounded during the campaign.

In all the actions during the war, the wounded have had to be removed from the field to distances varying from $2\frac{1}{2}$ to 23 miles; but this arrangement has been necessitated by the exigencies of the campaign, carried on in a rugged, wild country, where the scanty transport at first available did not permit the establishment of hospitals close to the army. It is one of the many disadvantages of the regimental hospital system in time of war that its supposed presence, and its theoretical perfectness, have prevented provision being exercised for cases where it is wholly inapplicable; no brigade or division hospital has been arranged so as to act as primary hospitals after actions. The extemporised accommodation of one or more bell-tents or marquees have constituted the field-hospitals, properly so called, during this war.

The wounded, after their transfer from the field of action, were treated in the general hospitals. Much of the success which has attended the treatment of wounds during the war has been owing to the care taken to allow plenty of fresh air to such cases. The huts in which they were placed were most thoroughly ventilated, not entirely by any designed system, but by the warping of the boards permitting the perfusion of air in all directions. The number of wounded placed in a hut was kept low, so that each man had 670 cubic feet of air allowed him, and when placed in marquees, 598 cubic feet.

These proportions may seem very small when compared with the allowance made in civil hospitals; but it must be remembered, that to erect hospitals of any kind in an enemy's country, and with the small available resources of an army engaged in harassing warfare, was a point of much difficulty. The men treated in the general field hospital huts in the Crimea had only 260 cubic feet of air each; in our field hospital at Queen's Redoubt we allowed to each wounded man in huts 670 cubic feet. The hygienic condition of the hospital was excellent, and at no time was there perceptible about it any of that peculiar hospital odour which indicates an impure atmosphere, and from the presence of which hospital poisoning arises. The general measures resorted to to preserve the buildings untainted were of the simplest kind—open doors and windows—so as to admit fresh air (the coolness thus caused was counteracted by allowing extra blankets to patients), the use of large pans of powdered charcoal placed near and on the beds of patients having extensive wounds with much suppuration; the instant removal of all foul dressings and of the discharges from patients. The use of a solution of "Condy's Disinfecting Fluid" was followed by excellent results. Wounds bathed with this lost their fetid smell, and this powerfully contributed to keep the air in the wards wholesome. Great attention was paid to keeping the hands of both medical officers and orderlies from carrying disease from one patient to another by frequent washing. It may excite a contemptuous smile to dwell on such trifling things, and to argue that owing to the influence of such small matters any material influence resulted favouring health and diminishing mortality; but the fact remains that from first to last, in the hospital at Queen's Redoubt, none of the complications so common in military hospitals in the field were seen. No case of pyæmia, of erysipelas, of hospital gangrene, or of tetanus, or secondary hæmorrhage occurred. The most formidable wounds healed readily, and some injuries, reckoned elsewhere the despair of surgery, did well there. It is true that circumstances were in every other way favourable for restoration to health of the wounded. The men were usually when admitted in most perfect health and condition; they had suffered no hardships to speak of in the short interval between their removal from the field and their reception. Hospital materials of every kind were abundant, and more than all, there is something peculiarly healthy in the New Zealand climate.

During the war there was one place at which, for a short time, wounds did not do so well—at Tauranga. Here the wounds were inclined to take an unhealthy action—the flaps of stumps sloughed, secondary hæmorrhage appeared, and the men generally did badly. The cause was evident, and, as it admitted of prompt remedy, Tauranga became as healthy as any other hospital. The wounded had been placed in a very comfortable house, where plastered walls and ceilings effectually prevented the irregular ventilation which was so beneficial in its effects at Queen's Redoubt hospital. The house acquired the sickly hospital smell, which was ineradicable; disinfectants did no good, and yet the cubic space allowed to each patient was not less than 800 feet. The patients were most of them removed from this house, placed in marquees, and at once everything was changed; the most unpromising wounds did well, and no more satisfactory cures could have been achieved anywhere.

The general principles in the treatment of gunshot wounds which were followed in this war need not be dwelt on. All surgeons are agreed on such points; and until another cycle of opinion comes round, the routine general treatment of wounds may be summed up as consisting in hygienic precautions, simplicity of dressings, abstinence from any interference made in deference to anticipated evil consequences, and dietetic prescriptions, having in view the most recent opinions on such matters; not the former ones, in which everything was voted to be an inflammation requiring to be subdued by starvation. The proper and liberal use of wine has been followed by most encouraging results. It is hardly necessary to say that chloroform was used in all cases, both those of operations and of explorations of wounds of peculiar importance, and requiring removal of fragments of bone.

During the war there have been admitted into hospital, on account of injuries received in battle, or gunshot wounds resulting from accident, 415 non-commissioned officers and men and 48 officers.

Of the 415 cases of wounds (gunshot) in men, 28 were accidental wounds.

The following Tables exhibit the prominent points of interest in the cases of

	Number admitted into Hospital.	Died.	Discharged to		Proportion of Deaths to Cases treated per Cent.
			Duty.	Invalided.	
Non-Commissioned officers } and Men	48	13	27	5	27.0
Officers	415	46	244	124	11.53

Of the above wounds only five were incised wounds, inflicted by tomakawks and spears ; 30 men have received more than one wound, some of them being equally severe with those under which they have been classed in the Returns.

Following the arrangement in the official nomenclature by which it is necessary to class wounds topographically, the first description of wounds to be catalogued are those of the head, and they are shown in the following Table. As the numbers wounded are comparatively few, it will be convenient to include both officers and men together in this and in the succeeding Tables of wounds ; but the wounds of natives treated in our hospitals will be shown in a separate section.

I. GUNSHOT WOUNDS OF THE HEAD.

Description of Wound.	Admitted.	Died.	Discharged.		Proportion of Deaths to Admissions per Cent.	Proportion of Class of Wounds to Total Treated.
			Duty.	Invalided.		
a. Wounds of Scalp	20	...	20	} 7.8 nearly.
b. Injuring Bones	5	...	2	3	...	
c. Fracturing Bones ... ..	...	...	...	...	...
d. Penetrating and injuring brain	11	11	...	...	100

Wounds of the Scalp.

*Wounds of
the Scalp.*

Of the 20 wounds of the scalp treated, all were of little importance. If it were permissible to judge from the experience of this war, there is nothing especially hazardous from a simple scalp wound—one uncomplicated with injury to the bony covering of the brain. If the scalp has, when injured, an exceptional liability to be attacked with erysipelatous inflammation, it has not been noticed in this campaign ; probably the question is one depending entirely on the good or bad hygienic condition of the hospitals in which wounded men may be treated.

In examining the records of the 20 cases, it appears that in two only was severe headache complained of during the course of treatment ; in no case did abscess or any untoward complication come on ; all the men and officers returned to their duty. The average stay in hospital of the whole of the 19 cases was 20.71 days ; the maximum being 80 days.

Wounds with Injury of the Bones of the Cranium.

*Injury to
Bones of
Cranium.*

Under this classification are included wounds not penetrating both tables of the skull, but simply laying bare the bone, or fracturing the outer table only. Wounds of this description have not been common ; only five have come under treatment, and of these two were discharged to duty and three were invalided. The average stay in hospital of the five cases was 70 days ; this, however, only represents the period at which cicatrization of the wounds took place ; the men could not be considered as well for some time after complete and sound cicatrization. The maximum period until cicatrization had taken place was for 100 days.

From this limited experience it would seem that exfoliation of the bones as a result of gun-shot injury takes place more rapidly than exfoliation of

parts of other bones. On examining the reports furnished, it appears that only in one case were there any threatening symptoms during the course of the treatment. In the case of the man referred to, exfoliation of the dead bone was attended with much constitutional disturbance for the first 20 days. There was severe headache, nausea, and occasional rigors; but the wound healed soundly in 89 days.

In two cases in which the wound injured the frontal bone near the orbit, permanent injury to the eye of the same side followed. In one case, the concussion caused detachment of the retina and injury to the iris, whilst, in the other, the loss of vision came on more gradually, and was due to retina changes.

The following Table exhibits the important particulars in the five cases:—

No. of Case.	Description of Wound.	Healed in Days.	Duty.	Invalided.	Remarks.
1	Injuring frontal bone right side, near orbit, and temporal ridge	100	..	1	Great exfoliation of bone. Sight of right eye much impaired from retinal changes.
2	Injury to outer Table, right frontal bone	90	..	1	Exfoliation. Severe headache.
3	Injuring right frontal bone, just over the superciliary ridge	26	1	..	Permanent injury to the eye. Detached retina.
5	Parietal bones, vertex of head	49	1	..	Healed rapidly at first, but reopened.
5	Injuring outer table, parietal bone	89	..	1	Much constitutional irritation attended the loosening of the dead bone.

During this campaign no cases have occurred in which both tables of the skull have been fractured without, at the same time, the brain having been penetrated. *Fracturing Bones.*

Wounds of the Head penetrating the Cranium and wounding the Brain.

Of this class of wounds 11 cases were admitted into hospital during the campaign, nine being cases of gun-shot injuries and two tomahawk wounds. *Wounds of Brain.* All the cases proved fatal; nine of the cases died within 24 hours, one case in five days, and one survived till the 91st day.

Of those cases which proved fatal within 24 hours little can be said. It is noted of two cases that in one consciousness was not entirely lost, and of the other, that consciousness returned before death. In both of these cases the cerebellum was shot through. It would seem that the immediate cause of death in wounds of the brain, dying within 24 hours, is not an excessive shock to the great nervous centre, but an irrepressible hæmorrhage.

In the case where the patient lived five days, the bullet penetrated the brain at the inner canthus of the left eye (forcing out the eye-ball), and then traversing the left lobe of the cerebrum obliquely, made its exit close to the mastoid process on the same side.

The case in which the patient survived for 91 days after a gun-shot wound of the brain appears to possess sufficient interest to justify a short account of its being inserted here.

Captain W. J. Hereford, 3rd Waikato Militia Regiment, on the 2nd April, 1864, in action at Orakau, received a wound by a musket bullet, which striking him near the junction of the left nasal and frontal bones, passed obliquely downwards and inwards into the brain, forcing out of the orbit and almost completely severing all the attachments of the left eye-ball. Through the wound the finger could be passed within the cranium, and cerebral matter escaped, along with comminuted fragments of the orbital plate of the frontal bone. The bullet could not be felt within the cranium. On receiving the

wound the officer was knocked down, and was stunned for some time, but ultimately recovered and became quite sensible and collected on the next day.

For seven days after receiving the wound the patient went on apparently well: he was easy and quite sensible. At the end of this time he became gradually more and more lethargic, and from this state passed into delirium of a low quiet kind, with unconsciousness to external impressions, and having no control over the sphincters. Stertorous breathing, and other signs of oppression of the brain, were also present, the pulse becoming at the same time preternaturally slow. From the wound there was a considerable discharge of a thin sanious matter. This state of insensibility continued for five days, during which the pulse gradually rose to 120, and the discharge from the wound became puriform. On the 14th day, without anything having occurred to account for it in the way of profuse discharge, as from an abscess, the patient recovered his consciousness, and the pulse fell to 96. On the 20th day from receipt of wound the patient was quite sensible, and was improving. He slept soundly, and the appetite was good. The pulse had fallen to a normal standard, varying from 60 to 68. A profuse purulent discharge came from the wound. Within the next week, a few sequestra of bone came away, and on the 33rd day he seemed to be recovering satisfactorily. On the 43rd day he was able to walk about a little, had a good appetite, and all the functions were well performed, excepting that his perceptions of taste and smell were impaired, and he was deaf in the left ear. The wound had filled in and was closed up; but a little discharge still came from the orbit out of which the eye-ball had been removed. Some induration about the articulation of the left lower jaw was present. On the 63rd day it was noted that he was going on very well, and was able to walk about two miles daily without feeling distressed. A day or two before, however, he had had an attack of darting pain over the left side of the head and face, which seems to have completely gone off until the 78th day, when he was suddenly seized with severe pain at the back of the head and neck, accompanied with vomiting; the respiration became laboured, and a state of lethargy came on from which he was roused with difficulty. It does not appear from the notes of the case that these untoward symptoms were due to any known imprudence on the part of the patient. On the 79th day, as it was thought, in consequence of active treatment by means of free purgation, &c., the patient became better, recovered consciousness completely, but he still complained of pain in the head, and his utterance had become very indistinct. On the 87th day, it is noted that the patient was becoming drowsy, though he was still able to be out of bed part of the day. On the 88th day the lethargy and somnolence had increased; he was only sensible at times, and then complained of pain in the head. In the evening he had a rigor, after which he became perfectly comatose, the pupil of right eye was dilated and fixed. He had constant twitching motions of the muscles of eye-ball, and convulsive movements of the limbs. In the course of next day there was again a partial return of consciousness, but, on the 91st day from receipt of wound, he died, after having been violently convulsed.

On a *post mortem* examination it was found that the bullet was lying behind and below the round edge of the left wing of the sphenoid bone, and enclosed in a partially organized sac. In contact with the bullet, which was much altered in shape, were two fragments of bone, which had been driven before it on its entrance. The petrous portion of the left temporal bone was fissured. There was a thin deposit of recently-effused lymph on the upper surface of the cerebrum, and the anterior border of the left lobe of the brain was firmly adherent to the adjoining parts near the orbit, but the external wound was quite closed and filled up with granulations. The track of the bullet through the anterior part of left hemisphere to base of brain was quite patent; a cavity the size of a walnut was present, and this communicated with the left lateral ventricle, the floor of which was lined with lymph, and it contained a quantity of yellow serum mixed with pus. The medulla oblongata was covered with what is termed in the report "a fibrinous deposit," and this also extended some way down the spinal column. The exact quantity of pus found within the lateral ventricle is not stated in the Report, but was small.

Remarks.—Guided by the experience of the above case in the treatment of a similar one, it would seem to be right on the coming on of symptoms denoting the formation of abscess (as in this case on the 87th or 88th day),

namely, rigors, increased pain, and somnolence, to re-open the original wound, say, with an elastic gum catheter, so as to permit the escape of the pus, and perhaps also to make a good exploration to try and extract the bullet.

In the treatment of gun-shot wounds of the brain nothing in the way of surgical interference has been practicable, or thought advisable; but if anti-phlogistic treatment is admissible in any case of gun-shot wound, I am of opinion that it would be in wounds of the brain; a practice, I believe, advocated by Stromeयर.

Wounds of the Face.

Of this description of injury there have been treated 21 cases, as shown in the following Table:—

Wounds of the Face.

Description of Injury.	Number of Cases.	Discharged to		Died.	Average Number of Days under treatment.	Proportion of Class of Wounds to Total of Cases treated per Cent.
		Duty.	Invalided.			
<i>a</i> Wounds of muscles of the face ...	9	9	...	...	24.6	} 4.53
<i>b</i> Wounds with fractures of the bones of the face ... } ... } ... }	12	6	5	1	67	

The first description of wounds, those of muscles of the face, were all of them unimportant, and require no further mention.

The wounds of the face complicated with fractures of the facial bones were of various degrees of severity, and were important both on account of the serious complications resulting from hæmorrhage, and also on account of their consequences, involving, as they did, much lasting discomfort to the patients.

The following Table gives a synopsis of the chief points of interest in the 12 cases:—

No. of Case.	Description of Injury.	Discharged.			Number of days under treatment.	Remarks.
		Duty.	Invalided.	Died.		
1	Fracture of lower maxilla	..	1	..	74	Numerous fragments of bone came away.
2	Superficial injury to right malar bone	..	1	..	55	Eyesight of right eye impaired, as a result.
3	Fracture with great comminution of right body and ramus lower jaw	..	1	..	104	Profuse secondary hæmorrhage, requiring ligature of common carotid artery.
4	Simple fracture, body lower jaw	1	..	..	41	No comminution. No complications.
5	Fracture of body of lower jaw	..	1	..	32	The fracture healed rapidly, but the bullet lodged behind scapula, and was not extracted.
6	Fracture of bone	1	..	..	40	Filaments of facial nerve injured. Anæsthesia of parts resulted.
7	Fracture of superior maxilla	1	..	..	78	Sight of left eye nearly lost, as a result of the concussion of eye-ball.
8	Shattering of superior maxilla	..	1	..	214	Much comminution of bone.
9	Fracture of teeth, and injury of alveolar process, upper jaw	1	..	..	14	No complications.
10	Fracture of bone	1	..	..	53	Exfoliation of bone.
11	Shattering of lower maxilla, both sides	..	1	..	..	Great comminution, much secondary hæmorrhage. Contraction of aperture of mouth, and upper and lower teeth out of line.
12	Fracture, with great comminution of both upper and lower jaw. Tongue carried away	..	..	1 In 5 days.	..	Death caused by great hæmorrhage, and by the shock of a very extensive wound.

Wounds of the Neck.

Wounds of the Neck.

The wounds classed under this head have been all of them of a very simple nature, mostly wounds of the integuments, or of the muscles: in no instance has the trachea or pharynx been injured, nor any important blood vessel. In two instances some branches of the cervical plexus of nerves were injured, causing prolonged pain and uneasiness in the parts supplied by them with nervous influence. It will be noticed that the average period which wounds of the neck required to heal was high—32 days, whilst wounds of the muscles of the face of as great average severity only required 22 days. The reason of this difference probably is, that wounds of the neck are extremely prone to become converted into sinuses, which resist treatment until slit up.

Description of Injury.	Number of Cases.	Discharged.		Died.	Average Period under Treatment. Days.	Proportion to Total Wounds Treated, per Cent.
		Duty.	Invalided.			
Wounds of integuments and muscles of the neck.. .. .	10	8	2	..	32	2.65

Wounds of the Chest.

Including all descriptions, there have been 38 cases of wounds of the chest under treatment in hospital, forming 8.40 per cent. of the whole cases treated. *Wounds of the Chest.*
All were gun-shot wounds.

The following Table exhibits the precise nature of the wounds of the chest :—

Description of Injury.	Number of Cases.	Discharged.		Died.	Average Number of Days under Treatment.	Proportion of Wounds to Total Treated, per Cent.
		Duty.	Invalided.			
a. Wounds of muscles of chest	11	10	1	..	35	8.20
b. Wounds injuring bones of chest .. .	1	1	..	..	116
c. Wounds penetrating chest, without entering lung .. .	3	1	2	..	92.6	
d. Wounds of the lung	23	1	8	14	Cannot be given in all cases.	

Wounds of the Muscles of the Chest.

Injuries of the muscles of the chest caused by musket bullets have been infrequent, only 11 cases having come under notice. In two instances, after wounds of this nature, it was imagined that the cavity of the chest had been opened, and that the lung was wounded, the symptoms so exactly resembled those present after a wound of the lung—collapse, dyspnoea, and hæmoptysis. Possibly the lung, in both of these cases, was bruised by the impact of the bullet, just as it might be after a heavy blow on the chest with the fist. The absence of emphysema, and the complete recovery without any pulmonic inflammation of consequence, showed the true nature of the case. *Wounds of Muscles of Chest.*

Wounds Injuring Bones of Chest without Perforation of Cavity.

Of this description of injuries only one case has occurred ; here the bullet in its course grazed one of the ribs at the base of the chest. The lung was uninjured, trifling exfoliation resulted, the wound healed in 116 days, and the patient (an officer) returned to his duty.

Wounds Penetrating the Cavity of the Chest without Wounding the Lung.

Three cases of this nature have occurred, one of which may be considered as doubtful. It was at first returned as a case in which the lung was penetrated. The patient, an officer (Ensign Doreton, 50th Regiment), was wounded in action at Rangiahia, on February 22nd, 1864, by a musket-bullet entering at the side of the chest, between the fifth and sixth ribs, and coursing under the skin, was removed by incision. On receipt of the injury some hæmorrhage from the mouth occurred, the patient had dyspnoea and collapse to a small extent, but no emphysema. Inflammation of the pleura was set up, but

eventually, in 73 days, he was cured, and able to return to duty. The supposition in this case is, that the costal pleura was opened, but that the lung was not injured further than by bruising.

The second case is that of Private Vickery, Auckland Militia, who, on August 13th, 1863, was wounded by a bullet from a revolver-pistol, fired close to him. The bullet penetrated through six folds of a folded great-coat, through his belt and clothes, and penetrated through the sternum four inches from its upper border, and lodged apparently in the anterior mediastinum. A probe passed to the depth of two inches in its presumed course failed to reach the bullet. On receiving the wound, the man felt confused, had dyspnœa, and, from the description given, seems to have in a slight degree suffered from shock, which passed off in the course of two or three hours. No hæmoptysis occurred. The wound healed in 98 days without any bad symptoms; the protracted treatment being due solely to the necrosis of small fragments of bone, and not to the presence of the bullet, which remained lodged within the mediastinum, giving rise to no special symptoms. The man was discharged an invalid; he is able to work at light employment, and the wound has cicatrized.

In the third case, that of Private John Ward, 70th Regiment, the sternum and ribs were fractured and the pleura penetrated, but there was no evidence of penetration of lung. There was nothing specially interesting in the progress of the case. The man was invalidated.

Wounds Penetrating the Lung.

The total number of cases under observation has been 23, of which 14 have died, eight have perfectly recovered, and one case was invalidated, but when invalidated home was in a fair way for recovery. Excluding this case from the calculation, it appears that the mortality amongst wounds penetrating the lung has been 60·87 per cent. of the cases treated. Before classifying cases under this head they have been rigidly scrutinised, and all doubtful cases have been excluded from the list, which may be taken to be correct. No case has been admitted in which air did not pass from the lung through the opening made by the bullet; collapse, dyspnœa, and hæmoptysis, being all of them fallacious symptoms, usually present when the lung is penetrated, but present also without penetration. That 29·13 per cent. of men wounded in the lungs have been saved does not seem much to boast of, but even this little is diminished, as it appears from an examination of the records of the various cases, that every one of the men recovering after wound of the lung had not been severely wounded. It is abundantly evident that in all the cases of recovery, either the outside of the lung only was grooved, or that the wound did not extend deeply into the lung. Where the lung or lungs were traversed death took place very speedily from hæmorrhage (and, bearing on this, it will be noticed that of men shot dead on the field, 50 per cent. were wounded through the chest), in a few cases where the bullet had entered the lung from above and traversed the greater part of its length. The wound was near the outer border of the lung, and away from the large blood-vessels. In these cases the patients did not die of hæmorrhage, but succumbed under the irritative fever set up in consequence of empyema—a wasting suppuration which they had no strength to meet. From date of receipt of wound till death, the average period of the 14 fatal cases was 21 days. Six of the cases proved fatal within one day, death being immediately attributable to uncontrollable hæmorrhage. In two other cases death resulted from hæmorrhage of a secondary kind, one being on the 20th day, the other on the sixth day, Necrosis of the injured parts of the ribs occurred in nearly every case; and in one case, where the sternum had been injured, considerable portions of it had become detached.

The following Synopsis exhibits the prominent points connected with the 13 cases :—

	No. of Case.	Description of Wound.	Recovered in Days.	Died in Days	Case not Terminated.	Discharged to Duty.	Invalided.	Remarks.
Private Scales, 40th Regiment	1	Through left lung, bullet escaping after fracturing scapula and ribs	...	33	...	...	...	Immediate cause of death was suffocation from pleuritic effusion. Lung quite compressed.
	2	Bullet lodged, right lung	...	1	...	...	...	Died from hamorrhage.
Private G. Whitfield, 65th Regiment	3	Shot through both lungs	...	2	...	...	...	Died from hamorrhage.
Sergt. Patrick Burke, 57th Regiment	4	Bullet escaped from chest through a second opening, and, lying under the skin, was extracted	60	...	...	...	1	Superficial wound of lung, the external wounds healed very rapidly.
	5	Bullet entered between 4th and 5th ribs, left side, and lodged	...	31	...	...	...	Died from pleuritic effusion. The bullet was found close to wall of chest within the pleural cavity and sacculated.
Private James Stattock, 40th Regiment. Invalided 5th August, 1864	6	Bullet entered close to the right clavicle, and made its exit near same spot	82	...	...	...	1	A very slight wound of lung, but unequivocal emphysema present.
A.B. Samuel Ruthven, R.N. Invalided	7	Bullet penetrated lung at the 5th rib, and lodged	63	...	...	...	1	In this case the pleuritic effusion seemed to be sacculated. The man recovered after the limited effusion emptied itself externally. Had also a compound fracture of humerus same side.
William Allison, R.N. Invalided	8	Bullet penetrated left lung about middle, and lodged.	...	...	1	...	...	Emphysema established. Was going on well 161 days after wound, when the man was sent home an invalid.
Private Henry Brown, 40th Regiment	9	Bullet penetrated right pleural cavity, and passed straight across to apex of left lung, and made exit	54	...	...	1	...	Emphysema on right side of chest only; much dyspnoea and hæmoptysis for six days, after which recovered well. To duty.
Private John Platt, 68th Regiment	10	Bullet traversed right lung from above down, escaping at the 9th rib laterally	...	87	...	...	...	At first excessive dyspnoea and shock. After this, hamorrhage and emphysema. The pleuritic effusion escaped readily by the opening of exit made by bullet.
Sergeant James Beattie, 68th Regiment	11	Bullet passed through the apices of both right and left lungs, but very superficially	71	...	...	...	1	A very limited and perhaps doubtful pleuritic effusion; part of bullet was expectorated through lung. Necrosis of part of the sternum followed the wound Invalided.
Private Ptk. M'Donald, 68th Regiment	12	Bullet entered right side of chest near sternum, between 4th and 5th ribs, and lodged	...	7	...	...	...	Immediate cause of death was pleuritic effusion.
	13	Shot through right lung, bullet lodged	...	1	...	...	...	Died from hamorrhage.
Private J. Cox, 40th Regiment	14	Shot through right lung	...	6	...	...	...	Hæmorrhage into cavity of pleura continued, and escaped through external wound. Death immediately due to this.
	15	Shot through left lung.	...	1	...	...	...	Died from primary hamorrhage.

	No. of Case.	Description of Wound.	Recovered in Days.	Died in Days.	Case not Terminated.	Discharged to Duty.	Invalided.	Remarks.
Private G. Norris, 50th Regiment	16	Shot through right lung	...	1	...	...	...	Died from primary hæmorrhage.
	17	Shot through right lung	...	1	...	...	...	Died from primary hæmorrhage.
Private James Forde, 65th Regiment	18	Bullet lodged in right lung	...	10	...	...	...	Died from pleuritic effusion.
Lieut.-Colonel Nixon, Defence Force	19	Bullet penetrated left lung at the 6th rib laterally, passed through edge of lung, and made escape near spine	...	96	...	...	...	Died from the excessive drain of the emphysema, but so far recovered that the wound had closed firmly on the 75th day; necrosed bone all detached.
Ensign Chayters, 65th Regiment	20	Right lung wounded at the 6th rib about its middle, bullet escaped four inches from the spine	...	20	...	...	...	Did remarkably well until the 20th day. Was supposed to be recovering. On that day violent secondary hæmorrhage came on, and he died.
Private Laydon, 50th Regiment	21	Bullet entered upper third anterior aspect right side of chest, and apparently lodged in the right lung	95	...	...	...	1	No primary hæmorrhage from the mouth. Pleuritic effusion and emphysema right pleura. Pus expectorated for a long time. The external orifice of wound healed in 16 DAYS. Invalided home.
Private Charles Rivers, 2nd Battalion, 18th Regiment	22	Bullet entering at centre of base of left scapula, entered chest and, traversing right lung, was extracted under it, between 8th and 9th rib in lateral thoracic region	158	...	...	...	1	No primary hæmorrhage from the mouth, but seven days after he spat up a quantity of blood. There was emphysema at first. Had pleuritic effusion. The right lung has never regained its function right side of chest.
Ensign Grant, 50th Regiment	23	Bullet entered the chest just above the first rib, very slightly injured the lung, and came out at upper posterior dorsal region close to spine	120	...	...	...	1	(An officer.) Had emphysema at first, but no hæmorrhage from mouth. Pleuritis followed.

In the treatment of gunshot wounds of the lung, nothing new has been learnt from the opportunities afforded in the campaign. Bleeding has been very generally, if not altogether, discarded. The inevitable result of a wound of the lung is pleurisy, and the effusion into the thoracic cavity is often so great as to destroy life by suffocation at an early period. In one of the cases recorded in the above Table, it will be seen that the effusion found its way through the opening of exit made by the bullet. This did not save the patient, but it gave him very great relief, and enabled him to prolong the struggle till the 87th day. It would seem to be a judicious proceeding to open the pleural cavity in order to afford exit to effused fluid as early as this can be detected. With this assistance, a very vigorous constitution may battle through the illness, which to a weaker man is almost certainly fatal. It is a matter of the first importance to *fix* the injured side of the chest. This is best and easiest effected by enclosing that side of the chest with broad stripes of adhesive plaster, so as to prevent all motion of the ribs, leaving an opening opposite the wound or wounds. The beneficial results of this practice were shown in two very serious cases of this nature, in the campaign of 1860-61.

Wounds of the Abdomen.

Of this description of injury there have been 23 cases.

Description of Injury.	No. of Cases.	Discharged.		Died.	Average No. of Days till Cured.	Proportion of Injuries to Total Wounded per cent.
		Duty.	Invalided.			
a. Wounds of muscles and parietes of abdomen	} 8	7	1	...	17*	} 5.0 nearly.
b. Wounds penetrating abdominal cavity, and wounding viscera	} 15	...	1	14	...	

* One undetermined.

The cases of wounds of the muscles and parietes of abdomen have all been of a slight nature, and require no further notice.

Wounds penetrating the Cavity of Abdomen, and wounding Viscera.

Of this dangerous kind of wounds there have been 15 cases, with 14 deaths. The interest in these cases centres in the one recovery. Of the 14 fatal cases little can be said. Wounds in the intestines, or other viscera of the abdomen, are followed almost immediately by extreme collapse, due probably as much to hæmorrhage as to shock. The exceptions to this are rare: one was noted here, where an officer, mortally wounded through the intestines, was able, in the excitement of his position, to assist in trying to carry off a wounded brother, and after being obliged to abandon this attempt, was able to walk to the rear; but commonly a person wounded by a bullet penetrating the abdominal cavity is from the first quite helpless. Peritonitis is very soon established, within three or four hours, and the majority die within two days. A very fairly accurate diagnosis can usually be made as to which viscus has been wounded, though this unfortunately is of little practical account. If the liver has been wounded, distressing vomiting is usual, and sometimes hiccough; if the kidney, blood will be noticed in the urine first passed after the injury, but often not after the first micturition.

The following Table exhibits a synopsis of the cases of perforating wounds of abdomen :—

Wounds of Muscles and Parietes of Abdomen.
Wounds penetrating the cavity of the Abdomen.

Number of Case.	Description of Injury.	Recovered in Days.	Died in Days.	Invalided	Remarks.
1	Bullet penetrated ilium and cœcum	..	2	..	Peritonitis set up.
2	Bullet traversed intestines	..	1½	..	Peritonitis set up (an officer).
3	Shot through spleen and left kidney	..	2	..	Peritonitis set up.
4	Shot through large and small intestines	..	1	..	Peritonitis commenced (an officer).
5	Bullet entered right iliac region, and wounded cœcum, and lodged in cavity of abdomen	140	..	1	No general, but a partial attack of peritonitis. Artificial anus formed, but closed after 80 days, re-opening, and finally closing soundly after 140 days.
6	Shot through large and small intestines	..	2	..	Extreme collapse. Died from hæmorrhage.
7	Shot through liver and right kidney	..	6	..	Died of peritonitis.
8	Shot through small intestines	..	3	..	" "
9	Shot through large and small intestines	..	2	..	" "
10	Shot through right kidney and liver	..	5	..	General peritonitis absent. Recovered completely from collapse. Died from exhaustion of obstinate vomiting and hic-cough (an officer).
11	Shot through hypogastrium and pelvis, and right ileum	..	1	..	(An officer). Death was caused proximately by hæmorrhage.
12	Shot injured right kidney and liver. Also had the right arm shattered by a large bolt	..	1	..	(An officer). Died in about 18 hours; he never rallied from the first collapse. Vomiting a distressing symptom.
13	Received two bullet wounds, first, in upper lateral region of abdomen; second, in ischiarectal fossa, traversing the abdomen upwards	..	1	..	Never recovered from the first collapse. Had distressing vomiting.
14	Wounded in the cœcum omentum, and bowel penetrated	..	1	..	Never recovered from the first collapse.
15	Bullet passed through wing of left ilium, the descending colon and the interior margin right lobe of liver	..	1	..	Severe and incessant vomiting followed wound, and patient died in 16 hours.

The chief points of interest, after a penetrating wound of the cœcum, are as follow:—The patient, Thomas Roberts, a seaman of the Royal Navy, was wounded in the attack on the Gate Pah, April 29, 1864, by a musket bullet, which, striking him in the right iliac region, about two inches above the middle of Poupart's ligament, penetrated the abdominal cavity, and lodged. From the position of the wound, it was inferred that the cœcum, or ascending

colon, had been injured. On the fourth day, fecal matter in some quantity passed from the wound, a very circumscribed peritonitis set in, and an effusion of lymph glued the edges of the wounded bowel to the abdominal parietes, forming a considerable flattened tumour at the site of the wound. From the wound large quantities of pus were discharged, and fecal matter for 81 days, getting less and less in quantity until it ceased altogether. The greater part of the feces had all along been discharged per anum; and though the man suffered somewhat from the profuse drain of the purulent discharge, his health never materially deteriorated. Fifteen days after the wound had closed up, it re-opened and continued open, again discharging fecal matter and pus until the 140th day, when it finally cicatrized soundly. The man was shortly after sent home as an invalid, enjoying good health, able to walk about, and feeling no particular uneasiness, except occasionally, when, owing to the pressure of the unextracted bullet, the sacral nerves were disturbed, and he had spasmodic pains in the hip, and down the thigh. The general health was very good.

Wounds of the Back and Spine.

Of this description of wounds there have been under treatment 25 in all. *Wounds of Back and Spine.*
The following Table exhibits the particulars of the cases :—

Description of Wounds.	Number of Cases.	Discharged to Duty.	Died.	Average Number of Days in Hospital till Cured.	Proportion of Cases to the Total Wounded, per Cent.
a. Wounds of muscles of back.. ..	19	19	..	49	} 5 40
b. Wounds of spine and spinal column ..	6	..	6	..	

The only thing requiring notice about wounds of the muscles of the back is the long average period which such wounds were under treatment—49 days. Such wounds are very apt to degenerate into sinuses; they run for a long way under the skin, and sinuses do not heal until laid open. Wounds through the thickness of a muscle heal much more rapidly than wounds having little more over them than the thickness of the skin, and superficial fascia.

The following Table gives a synopsis of the cases of wounds of the spine and spinal column. All the cases treated have proved fatal, but less rapidly so than cases of wounds of the thoracic or abdominal viscera :— *Wounds of Spine and Spinal column*

Number of Case.	Description of Injury.	Died.	Number of Days till Death.	Remarks.
1	Shot through the neck ; the third cervical vertebra injured	1	70	Great primary hæmorrhage. No paralysis till the 5th day, when head symptoms set in, and a gradually increasing paralysis followed.
2	Body of eleventh dorsal vertebra shot through ; spinal cord injured at first	1	28	Complete paraplegia from the first, below the injured part.
3	Fifth cervical vertebra injured	1	3	Was paralysed and insensible from the moment of receiving the wound.
4	Ninth dorsal vertebra injured	1	6	Paraplegia did not come on till 5th day.
5	Region wounded, not remarked	1	6	
6	Shot through twelfth dorsal vertebra	1	2	Paraplegia of parts below injury. From the first complained of excruciating pain at seat of injury.

In the first of the cases recorded above there are some points of interest. Private Thomas Carney, 1st Battalion 12th Regiment, was wounded in action, August 2, 1863, by a musket bullet, which, entering the neck (right side) at the posterior margin of the mastoid muscle, one inch below the ear, took a downward oblique course, and came out below the angle of the lower jaw on the left side. When received into the field hospital next day, the patient was very weak, having in the interval lost much blood. It is noted that next day the patient spat up a considerable quantity of blood, but no discriminating remark is made as to the origin of this blood. Five days after receipt of injury head symptoms first appeared. The man became drowsy, and slept much ; and five days later the remark is made that great pain in the back of the head had come on, but it was not until 29 days after the injury that it was certain the vertebral column had been touched. At that time, from the increasing paralysis of the arms and legs, this was deemed certain ; the sphincters also failed at this time. He gradually sunk from the exhaustion of bed-sores, 70 days after the receipt of the wound.

On examination after death it was found that the body of the third cervical vertebra had been injured, and that the spinal cord was pressed on by spiculæ of the carious bone.

Amongst the points of interest in this case, seem to be—1. The little impairment of general health after receiving so great an injury, an injury close to the spinal column, near to which nerves of the first importance are given off. It is noted in the case-book, some eight days after admission, that “ the man was then doing well and gaining strength.” 2. The very gradual coming on of paralysis, and the fact that the phrenic nerves do not seem, even at the last, to have been affected ; death did not occur suddenly from a stoppage of the respiratory function, resulting from involvement of the phrenic nerves near their origin, but from a very gradual exhaustion of all the vital powers. 3. The strength of the ligaments of the vertebral column is illustrated by this case ; there was no immediate, even partial, luxation of the vertebra after the blow caused by the passage of a bullet across its body.

Next in order come wounds of the perinæum, generative and urinary organs.

Of this description of wounds only five have been treated. The following *Wounds of Perinæum, &c.* Table exhibits the particulars of the cases :—

Description of Wound.	Number of Cases.	Discharged.		Died.	Average of Days under treatment.	Proportion of Cases to total Wounded treated.
		Duty.	Invalided.			
Wounds of Muscles of Perineal Region	2	..	..	..	45	} 1.08
Wounds of Urethra and Scrotum ..	3	2	1	..	31	

Only one of the above wounds was of any severity, that of Private John Baxter, 68th Regiment, wounded in action at the Gate Pah, April 29, 1864. This man received a wound from a rifle bullet fired close to him, which entered the perineum, passed obliquely upwards, and made its exit near the root of the penis on the right side. In its course the bullet cut the urethra across, and also divided the right spermatic cord; and there was considerable hæmorrhage from this source into the right tunica vaginalis. In the progress of the case, when the track of the wound threw off the sloughs, it was found that the coats of the rectum had been injured, and fecal matter, as well as urine, passed through the opening of entrance. In spite of all the untoward complications, the man made a rapid and very satisfactory recovery, the wounds having cicatrized soundly in 58 days. The fistulous opening into the rectum contracted and healed up without any operative measure, and the urethra cicatrized also very well. No injury was done by the extravasation of urine into the parts adjoining. In treating the case, a catheter was at first used twice a day to draw off the urine; but this was found to do harm by irritating the wounded urethra, and breaking up granulations. The use of the instrument was discontinued, and after this cicatrization went on rapidly.

Wounds of the Upper Extremities.

Of this class of cases there have been treated 132 cases, being 28.5 per cent. of all wounds: of them, 91 have been cured and returned to their duty, and 41 have required to be invalided home. There have been no deaths among the men or officers returned as wounded under this head. *Wounds of Upper Extremities.*

The following Table exhibits the particular injuries of the upper extremities:—

Description of Wound.	Number of Cases.	Discharged.		Amputations.	Average Number of Days till Wound healed.	Note.	Proportion of wounds to total Wounded per Cent.
		Duty.	Invalided.				
a. Superficial wounds	22	22	21	..	} 28.5
b. Wounds through muscles	50	48	2	..	49	..	
c. Injuries of bones, without complete fracture	10	2	8	..	100	1	
d. Fractures of clavicle	4	1	3	..	138	..	
e. " of scapula	5	2	3	..	79	2	
f. " of humerus	10	2	8	1	94	3	
g. " of radius or ulna	11	4	6	..	60	4	
h. " of metacarpal and bones of hand ...	20	9	11	..	51	..	

Note 1.—Two cases remained under treatment unhealed when invalided, after 129 days' treatment.

Note 2.—The average of 4 cases only is given. In the 5th case the wound was not healed on the man's being invalided home, after 125 days.

Note 3.—This refers only to the time that union took place, and the wounds had cicatrized, not to perfect recovery. In one case a false joint with ligamentous union followed.

Note 4.—In one case partial paralysis of motion and sensation of hand remains.

*Superficial Wounds of Upper Extremities.**Superficial Wounds.*

Of 22 men slightly wounded, all were returned to duty after an average time of 21 days—the maximum stay in hospital of any man thus wounded having been 48 days. In only five instances have wounds treated in this campaign taken on anything like an unhealthy action, and two of these have been in men wounded superficially in the upper extremities. Superficial wounds are more prone to take on phagadenic action than any others. The explanation of this is not obvious.

*Wounds through Muscles of the Upper Extremities.**Wounds through Muscles.*

Of this description of wounds there have been 50 cases. Of these, 48 returned to their duty, and two were invalided home on account of contractions of muscles and injuries of nerves. In five cases, where contraction of muscles followed after wounds, they were successfully treated by forcible extension under chloroform, and the men recovered well and returned to their duty. In the case of the men (two) invalided, the bullets had injured, in their passage, large nerves, producing a partial paralysis which would require a long time to be recovered from. During their progress towards recovery, wounds through the muscles of the arm have been remarkably free from any troublesome complications; no secondary hæmorrhage, no phagadenic action, has ever occurred. In this respect these wounds have partaken of the favourable influences which have so much contributed to the restoration to health of the wounded in the campaign.

*Injuries to Bones of Upper Extremities, without complete Fracture.**Injuries to bones.*

Under this classification have been included those wounds in which a bone or bones have been either simply brushed by bullets, or, if penetrated, where the fracture has been but partial, not complete. Injuries of this class have an importance which would not be predicated of them without an experience in their treatment. They are at first always of uncertain diagnosis; they are, in their course, exceptionably liable to serious complications, to exfoliations, to the formation of abscess, and their results are commonly unsatisfactory. Adhesions to the injured bone of the tissues in contact always occur, and generally to so great an extent as to unfit a soldier for future service, or to very materially impair his usefulness: thus of ten cases under treatment, eight required invaliding. The progress of such cases is also very slow and paradoxical, as it may seem the less the injury, frequently the longer does the case remain under treatment; the bullet doing little more than brushing the periosteum, the process of exfoliation or necrosis of the bones, in contact with the injured periosteum, goes on slowly; the bone deprived of vitality exfoliates, but the process of detachment takes a long time, and is commonly attended with the formation of abscesses. Of the ten cases, two were unhealed when sent to England; the remaining eight cases took an average of 100 days each to heal, and even then there was often the expectation of the wound re opening, and further exfoliation accruing. In comparison with such wounds, complete compound gunshot fractures of the humerus heal fast. It will be observed that the nine cases of this injury had cicatrized soundly; union was complete, and both the outer wounds had closed in 94 days.

*Fractures of the Clavicle (Gunshot).**Fractures of Clavicle.*

Of this description of wound there have occurred four examples. Two of them were invalided, the injuries being complicated with further mischief, the bullets, after comminuting the clavicle, having injured the nerves of the cervical plexus. Extensive exfoliation took place in both cases, which, independently of other injury, would unfit the men for a soldier's duty, on account of the extensive adhesions in parts demanding mobility.

*Fractures of the Scapula.**Fractures of Scapula.*

Five cases of this injury, resulting from gunshot wounds, in which this was the principal feature, have been treated; and of these, two have returned to their duty, and three have been invalided. The average period under treatment, in four cases, has been 79 days; the fifth case remained unhealed when

sent to England. None of the cases have had extensive injuries; but here again, as in the cases of fractured clavicle, after exfoliation and cicatrization, the mobility of the shoulder-joint is interfered with, and a man's usefulness as a soldier is injured.

Fractures of the Humerus.

Of gunshot fractures of the humerus, solely and uncomplicated with wounds of the shoulder or elbow joints, there have been ten cases treated. Of these, *Fractures of* one case was submitted to amputation, and nine recovered without this *Humerus.* measure. In one case, proper union of bone did not take place; a ligamentous union with a false joint has followed. There was also another case of gunshot fracture of the humerus, which did well; but the patient has already been accounted for under the head of penetrating wounds of the lungs.

The following Table exhibits a synopsis of the cases of gunshot fracture of the humerus:—

Number of Case.	Seat of Fracture.	Discharged		Amputation.	Recovered in Days.	Remarks.
		Duty.	Invalided.			
1	Lower third of humerus	..	1	1	72	The bone was much splintered, and was amputated in consequence.
2	Lower third of humerus	..	1	..	37	Much callus thrown out at seat of fracture, impairing use of elbow-joint.
3	Upper third of humerus	..	1	..	102	Large fragments of bone came away.
4	Upper third of humerus	..	1	..	90	A very mild case, almost a simple fracture. The bullet did not penetrate quite to the bone.
5	Lower third of humerus	1	..	..	112	Contraction of muscles, after consolidation, was complete; overcome by forcible extension under chloroform.
6	Lower third of humerus	1	..	..	39	Very little comminution.
7	Middle of humerus	..	1	..	112	Fragments of bone came away, keeping the wound open. Musculo spinal nerve injured.
8	Middle of humerus	..	1	..	60	A large piece of the shaft of the bone removed. Firm union in 60 days, without any complications.
9	Lower third of humerus, with splitting into	..	1	..	86	No union by bone. Ligamentous union and false joint in 86 days. No known cause. Wounds of exit and entrance had healed readily.
10	Middle of shaft of humerus	..	1	..	137	Also wounded severely in leg. Had a very excellent arm. No shortening, but the muscles are still weak.

In the case of the man (a sailor, Royal Navy) wounded in the lung, and having also a gunshot (wound) fracture of the humerus, the bone was fractured at the upper 3rd, and necrosis had taken place, and the external wounds had cicatrized in 63 days.

On reviewing the above 10 cases of fracture of the humerus, it is found that eight of the number united solidly and well, and that in one case only was amputation had recourse to; here the amputation was primary. Guided by the experience of the above cases, it would be fair to expect that when 80 per cent. of gunshot fractures of the humerus recover without difficulty, that amputation of the arms in such cases might be delayed for secondary operation, if, after all, found to be necessary. It may be objected to this that the description of fire-arms used by the insurgent Maories against our men threw bullets less destructive than the bullets of rifled muskets now in ordinary use for military purposes. It is however a doubtful point whether such is or not the case—doubtful how far preconceived theory of the superior penetrating power of a conical bullet over that of a round one has influenced public belief in the matter.

In one case—No. 9—ligamentous union and false joint resulted from the fracture. There was no particular known constitutional cause to account for this exception to the rule of good bony union of the fractures of the humerus. The same thing is known to occur after simple fractures of the same bone, and it cannot therefore be brought as an objection against the conservation adopted. Amongst the wounded Maori prisoners, one of the cases of fractured humerus also healed by ligamentous union. It will be noticed further on.

Fractures of the Radius or Ulna.

Fractures of Radius.

Fractures of the radius or ulna, or both, have occurred 11 times during the campaign. Of these, four have returned to their duty, and six have been invalided in consequence of injury to the tendons of their muscles, unfitting the men for military service. Fractures of the bones of the forearm readily unite after the dead splinters have been detached, and of themselves such injuries are not particularly important; were the bones simply fractured and comminuted, the subsequent loss of function of the forearm would not be great, but few injuries of this sort are uncomplicated with destruction of the tendons, and commonly enough some large nerve is at the same time divided. It is to such complications that the comparatively large amount of invaliding has been due. The nearer to the hand, as a matter of course, the more disabling in its ulterior consequences is a gunshot fracture of the bones and the forearm; in the lower third of the forearm the tendons cannot escape injury, and there re-union is impossible.

The following Table exhibits the particulars of the cases:—

Number of Case.	Seat of the Fracture.	Discharged.		Recovered in Days.	Remarks.
		Duty.	Invalided.		
1	Radius and ulna, middle	..	1	94	The radius united well, but in the ulna only ligamentous union took place.
2	Radius and ulna, lower third	..	1	162	Secondary hæmorrhage from ulnar artery on the 14th day. Consolidation good, but the function of the limb much impaired.
3	Radius only, about middle	1	..	57	No great shattering of the bone.
4	Radius only, upper third	1	..	135	Long continued exfoliation, but eventually made a good recovery.
5	Radius only, middle	1	..	33	Very little displacement.
6	Radius and ulna, upper third	..	1	47	The fracture united well. The man was at first sent to duty, but was eventually invalided on account of weakness in the forearm.
7	Ulna only, about middle	..	1	46	Weakness remained after union of the fracture.
8	Ulna, lower third ; radius, at upper third	..	1	56	There was great shattering of both bones.
9	Ulna only, about middle	1	..	47	Not much displacement.
10	Radius and ulna, about middle	..	1	53	Weakness of the limb remained after union.
11	Fracture of left radius, about middle. (The bullet passed through interosseous space, and emerged near the elbow)	..	..	39	Wounds healed 39th day. There is much adhesion in the track of wound, and also partial paralysis of motion and sensation of the hand. Case awaits invaliding.

Average number of days the ten cases took until the fractured bones completely consolidated, 67.

Fractures of Metacarpal and Phalangeal Bones of the Hand.

There have been 20 cases of this injury treated, and of them nine have been returned to their duty, and 11 have been invalided. An average period of 51 days elapsed before fractures of this kind united. Injuries to the articulations and to the tendons of the hand account for the large proportion of invaliding. A great deal of difficulty is experienced in keeping gunshot fractures of bones of the hand in a proper position ; the painful swelling of the hand caused by suppurating under the thick fascia prevents the hand being placed in the ordinary position for simple fractures ; the bones are also sometimes fairly dislocated by the force of the blow of the bullet, and a proper adaptation of the fragments, if made, cannot be maintained. Hence such fractures commonly unite with deformity, and the use of the hand is greatly impaired.

Fractures of Metacarpal Bones.

On the treatment of gunshot fractures of the upper extremities, nothing need be said. In a *résumé* of the records of hospital practice, such as is attempted in this Report, the object is to give facts which may be useful ; to record the commonplace routine of the ordinarily accepted surgical treatment of fractures would be a waste of time.

Treatment.

*Wounds of the Lower Extremities.**Wounds of
Lower
Extremities.*

Of injuries classed as wounds of the lower extremities, there have been treated 133 cases, of which 6 have died, 91 have been returned to duty, and 31 have been invalidated, 5 still remaining at the end of 1865.

The particulars are shown in the subjoined Table :—

Description of Injury.	Number of Cases.	Discharged.		Died.	Amputated.	Average Number of Days under treatment.	Note.	Proportion of Wounds to total wounded per Cent.
		Duty.	Invalided.					
a. Superficial wounds...	20	20	24	...	28.72
b. Wounds through muscles	77	67	9	2	...	50	1	
c. Injury of bones without complete fracture	10	4	6	...	...	77	2
d. " of bones of pelvis	5	1	1	3	...	...	3
e. Fractures of femur (one)	7	...	5	...	...	118	4
f. " of both bones of femur	1	...	...	1	...	...	...
g. " of tibia or fibula	5	...	4	...	2	150	5	
h. " of bones of foot	7	1	5	...	1	90	6	

Note 1.—The wounds had cicatrized at date. The average of 65 cases only given, one case remaining under treatment.

Note 2.—The average of seven cases is only given. The other two cases remained unhealed when invalidated.

Note 3.—One case recovered in 104 days ; the other case is still unhealed at the end of 456 days. *Vide* record of cases afterwards.

Note 4.—The average of four cases is only given ; three other cases were still unhealed at the end of year.

Note 5.—Two cases undecided at the end of year.

Note 6.—One case remained unhealed at the end of 1865.

*Superficial Wounds.**Superficial
Wounds.*

Of the 20 men wounded simply through the skin and fascia, all recovered and returned to their duty in an average period of 24 days, which approximates pretty closely to the period which the same description of wounds in the upper extremity took to heal, namely, 21 days. In one case, phagadenic action was set up, but this condition was promptly arrested by a suitable means, and the man recovered thoroughly. At the time of the occurrence of the sloughing the man was treated in an old wooden building formerly occupied as a barrack-room—a place only occupied as an hospital on the ground of necessity.

*Wounds through Muscles of the Lower Extremities.**Wounds
through
Muscles*

Of this description of wounds 77 cases have been treated ; 67 of the number were completely restored to health and to the ranks in an average period of 50 days. Nine men were invalidated on account of structural weakness remaining after the cicatrization of their wounds, or contraction resulting from the sloughing of injured tendons. One man died who had received a wound from a bullet traversing the thigh. The cause of death in this case was certainly not the wound, but an attack of dysentery—true dysentery—which came on, and under which he succumbed after 70 days. The second case of death following a gunshot wound of the muscles of the lower extremities was that of a soldier of the Taranaki Militia, Sergeant Appleby, who was wounded in action, 25th March, 1864, by a musket bullet through the muscles of the lower third of the right thigh. The bone was uninjured. Much mental disquiet existed in this man from the first. On the 11th day he was attacked by tetanus, and he died on the 12th day. As this soldier was treated in the Militia hospital, full particulars of his case, *e.g.*, the post-mortem appearances, are unknown. Only one other case of tetanus occurred during the war, and that in a wounded Maori prisoner.

Wounds through the muscles of the lower extremities have been attended with rather more complications than those of the upper—abscesses have been more common. The great depth to which bullets in the nates may penetrate

has caused some wounds to be very tedious in healing. In seven cases the bullets remained unextracted; in two of these cases the bullets were very small—slugs, in fact. In the rest of the cases of lodged bullets, considerable inconvenience was experienced, and doubtless the wounds will be likely to re-open from time to time.

Secondary hæmorrhage occurred in two cases during the sloughing stage of the wounds; in both, though sufficiently troublesome, it required no operative measures for its repressing.

In three cases nerves were injured, but not to the degree making it necessary to class the wounds differently; the injuries were likely to be recovered from. In one case, in which contraction of the muscles and ligaments after cicatrization impeded the use of the knee-joint, forcible extension under chloroform was had recourse to; it benefited the case, but the man was not fit even after this to march and perform anything like efficiently a soldier's duties.

It will be noticed how strangely uniform has been the period required for the cicatrization of wounds of the upper extremity and those of the lower. The figures in each case have been furnished by many different surgeons, and yet, on adding together, the result is that wounds of the muscles of the upper extremities have taken, until cicatrization, 49 days, and wounds of the muscles of the lower extremities have cicatrized in 50.

Injuries of Bones of Lower Extremities.

Injury to the bones of the lower extremities without a complete fracture has occurred in 10 cases; and of these four have returned to their duty, and six have been invalided. Of this injury in the lower extremities it may be said, as of similar injuries in the upper extremities, that they are in their effects almost as bad as complete fractures, and in the time which they require for cicatrization somewhat worse. Slow exfoliations, with the formation of abscesses, acute pain, and much constitutional irritation, are their characteristics in some cases.

Injuries of Bones of the Pelvis.

Of this class of injury, where the bones of the pelvis have been shot through by bullets, there have been five instances. Three of the cases proved fatal, one man recovered and went to his duty, and the remaining case was invalided, the wound being at the time, 470 days after injury, still uncicatrized.

A synopsis of the points of prominent interest is given in the Table following:—

No. of Case.	Description of Injury.	Discharged.			Recovered in Days.	Died in Days.	Remarks.
		Duty.	Invalided.	Died.			
1	Anterior superior spinous process of ilium injured by bullet which lodged in the muscles of thigh	1	..	..	104	..	Exfoliation of injured bone. Recovery not very complete.
2	Musket bullet through the sacroiliac synchondrosis, penetrating the pelvis, and lodging within the cavity	..	1	..	..	..	Wound still open in 470 days.
3	A bullet striking the stock of the man's rifle, drove a splinter of it into the thigh under Poupart's ligament; the bullet fractured the ramus of pubis	..	..	1	..	66	Strength exhausted by the profuse discharge accompanying the loosening of the fractured pieces of bone.
4	Musket bullet perforating the body of the ilium, whence it was extracted	..	..	1	..	79	The wound healed, but the exhaustive suppuration brought on phthisis, of which the man died.
5	Musket bullet injuring the neck of the right femur, fracturing the eschium, and lodging in pelvis. Was also shot through the muscles of the arm	..	..	1	..	24	Died on the 24th day; the bullet had been passed per anum.

In the case No. 2 of the above there are points of interest, particularly in connection with the prognosis of similar wounds. A short statement is therefore given.

Thomas Jerran, a sailor of the Royal Navy, was wounded at the assault on the Gate Pah, April 29th, 1864, by a musket bullet which struck him on the sacrum on the lateral mass of the third body left side, traversed the bone, and lodged within the pelvis. An exploration of the wound was made whilst the patient was under chloroform; numerous fragments of the sacrum were removed (the wound having been enlarged for the purpose). The precise injury within the pelvis could not be ascertained; it was imagined that the wound was a mortal one. The patient thought that he could feel the bullet lodging about the site of Poupart's ligament on the left side. Very great constitutional irritation was speedily set up, and for weeks the patient hovered on the brink of death. Profuse wasting suppuration with hectic fever attended the separation of the injured pieces of the sacral bone, of which about 30 fragments came away. They varied in size from about the size of a pea to an inch and a-half. It was soon seen that the bladder had escaped injury, and as no peritonitis was set up, it is probable that the bullet, after piercing the sacrum, had coursed round the pubis below the peritoneal lining. Thirty-eight days after receipt of wound, an abscess had formed, and was opened just above the centre of Poupart's ligament (the spot at which the patient thought the bullet had lodged), and the abscess discharged profusely for nearly a year. From it also was discharged one small fragment of bone, apparently a piece of the ilium. The abscess finally contracted, and sound cicatrization took place at the external opening. After the lapse of 470 days, the original wound of entrance in the sacrum is still open, and from time to time fragments of bone

are discharged. The health of the patient is now however very good, and he is able to walk about, and there is every prospect of the exfoliation of bone soon ceasing. The bullet is now thought to be half way down the thigh. The patient can feel it when he is in certain postures; it then presses on the crural nerve and produces numbness of the parts.

Fractures of the Femur.

Gunshot fractures of the femur have furnished eight cases during the campaign, seven of them being of one femur only, and in one both femurs were shattered by the bullet. The successful treatment of injuries of this nature has been a marked feature in the surgical practice of the war, and one of which the medical officers concerned may legitimately boast. The large mortality of cases of this kind in European campaigns is notorious; books on Military Surgery teem with admonitions to the neophyte in the practice of the art not to be led away by the weakness of fancying that in his hands such wounds will do better than in those of his predecessors; he is urged to give the sufferer in all cases of fracture below the upper third such chance of recovery as may be obtained by amputation, and in fractures above or at the upper third of the humerus he is counselled to leave the patient alone because of the nearly equal chance of death after or without an amputation. Happily for the patients this teaching has not swayed the practice of the various surgeons in this war, and the results are, that out of six cases of gunshot fracture of the femur at various parts, five have recovered, four of them with very useful legs; one man wounded through both bones died. This incontestible success in the treatment of gunshot fractures of the femur deserves record,—and though the numbers are very small, even some investigation; and this need not be very profound. The reason of the success—the reason why 83·4 per cent. of gunshot fractures of the femur have recovered in this campaign, and without the limbs having been amputated, is due to two circumstances, and chiefly to one, namely, that the men who sustained such injuries were at the time in the very highest possible state of health; there was everything to expect that nature would set about vigorously to repair the mischief. No scorbutic or malarious taint was present in the men to render nugatory the efforts at vital conservation, and this may be said to be everything. In this war, when once received into field hospitals, the patients have had no more moving about till after recovery—no painful journeys over bad roads; rest, good diet, a pure hospital air, and every needful attention, with the use of every desirable appliance, have luckily in this campaign fallen to the lot of the wounded soldier. The surgeons in the field, knowing the condition of health in which their patients were, knowing that stationary hospitals in which the patients would have every chance were provided for them, discarded the teachings of the very eminent men who had treated gunshot fractures of the thigh under widely different circumstances, and were rewarded by the satisfaction of restoring to health men who, in other campaigns, would at the very best have recovered irrevocably maimed and mutilated. It is not contended that the conservative procedure would succeed in European campaigns, in crowded hospitals, in men starved before receiving their injuries, and perhaps with fever poison in them; but under circumstances similar to those in New Zealand campaigns, the success here obtained might be usefully borne in mind.

It would be difficult to explain away this high average of success unless by taking the ground that the cases are too few to affect contrary experience; that the five cases of recovery without amputation made simply a string of lucky accidents—an assertion equally difficult to controvert or to prove. The great apparent objection to the cases treated here being allowed to reckon in any way as precedents, arises from the fact of most of them having been caused by small bullets fired from old muskets or double-barrelled guns. It might be maintained that a gunshot fracture effected by a conical bullet would be vastly more destructive to the bone, and consequently would completely alter the case. It might be said that the question was about two different injuries. There may be some force in this argument, but it ought by no means to be allowed to go unquestioned. Reasoning from the effects which are known to arise from the passage of bullets at a high velocity through bodies, even more

*Fractures of
Femur.*

brittle than human bones, we might expect that a conical bullet driven from a rifled musket would pass through a bone with less destruction to it in the way of splitting and splintering than a round bullet having a less velocity; the first ought to make a clean hole, the other a ragged one. This is exemplified when a pistol bullet is fired at a pane of glass in a window; if near, the bullet simply punches a hole in the glass; if at a further distance, that is, if it has lost its velocity, the pane of glass is shattered. If it be objected that not theoretical reasoning, but experience, has proved that conical bullets are more destructive in their effects on bones than round ones, it may be answered, that as far as this particular question is concerned, military surgeons living before the introduction of conical bullets, averred that the splintering of round bullets was exceedingly great, and the specimens in any museum will confirm this. It so happens also, that one of the gunshot fractures of the femur which was under treatment here, and in which there was union of an excellent kind, was caused by a bullet fired from the Enfield rifle of a comrade. Another case of recovery after gunshot fracture of the thigh near the middle (rather above it), which has not been included with the six cases, was also inflicted with an Enfield rifle bullet, the patient being a Maori woman wounded at the assault on the Orakan Pah; in this case a perfect recovery, with firm union, took place. It may be assumed that the fractures here treated successfully without amputation were of average severity; one of them, in fact, was as extensive as it could be in any case not resulting from a round shot or piece of shell.

The following Table exhibits a synopsis of the points of interest about the six cases, with two others uncompleted (Nos. 7 and 8).

Number of Case.	Description of Wound.	Recovered with Union.	Died.	Recovered in Days.	Remarks.
1	Bullet struck just below the great trochanter	1	..	..	Firm union at the end of 285 days, but the spiculæ were still numerous, and required removal by operation. The man's health very good. Wound not closed 320 days after injury, when invalided home.
2	Middle of the thigh ..	1	..	94	Very little constitutional disturbance. The case went on exceedingly favourably. Useful leg.
3	Middle of the thigh ..	1	..	72	Firm union. Useful leg.
4	At junction of lower with middle third	1	..	147	Firm union. Very useful leg.
5	At junction of lower with middle third	1	..	220	Firm union. Very useful leg.
6	Bullet struck two inches above right knee, and traversed; then entered opposite thigh, at about the same point, and passed completely through	..	..	..	Died in 20 days. Great primary shock and some hæmorrhage. The knee-joints not opened, or the bone split into th. m. Had just recovered from an attack of dysentery.
7	Compound comminuted fracture of upper third of right thigh	..	..	..	Much exhausted by discharge, and suffering from bed sores. Improving a little at end of year—107 days after wound. Prognosis favourable.
	Severe gun-shot fracture of femur between upper and middle thirds. Bullet struck outer side of limb, and lodged	..	..	..	Progressing very favourably, and bone uniting fairly by end of year—70 days after date of wound. Prognosis most favourable.

For the sake of illustrating an important subject, it may perhaps be allowable here to add the particulars of three gunshot fractures of the femur occurring to wounded Maori prisoners treated in our hospitals.

Number of Case.	Description of Wound.	Recovered in Days.	Died in Days.	Remarks.
1	Fracture of upper third of femur	..	83	This Maori apparently did all in his power to prevent his wound healing, forcibly removing the leg from the apparatus. He seemed resolved to die.
2	Fracture at junction of upper and middle third	72	..	A Maori woman. Excellent firm union, and she could use the leg well.
3	Fracture of middle third of thigh	..	3	This man had in addition a gunshot fracture of the fore-arm, and he was also shot through the muscles of the right thigh.

If all are added together, there will be found nine cases, of which six recovered without amputation, and three died without it; but of the three last, one man shot through both femurs close to the knee-joints, and being very weakly from previous ill-health, had no chance from the first; whilst in another fatal case the wounded Maori may fairly be said to have absolutely destroyed his chance of recovery; and in the last case of a wounded Maori the number of his wounds greatly diminished his chance of recovery. The two last cases of eight given in the previous Table are too recent to determine the issue, but in both recovery may be confidently expected.

Fractures of the Tibia and Fibula.

Of this description of injury there were five cases, two of them having much shattering of both bones of the leg, with injury to the blood-vessels, required amputation at the upper fourth of the leg. All the men were invalided on account of these injuries. *Fractures of Tibia.*

The following Table shows the particulars of the cases:—

Number of Case.	Description of Injury.	Invalided.	Amputated.	Recovered in Days.	Remarks.
1	Both bones of leg shattered, with bleeding from large vessel	1	1	88	Primary amputation at upper fourth of leg.
2	Both bones of leg shattered	1	1	158	Primary amputation at upper fourth of leg. Sloughing of stump. Secondary hæmorrhage on 26th day, requiring ligature of femoral artery. Necrosis of end of tibia.
3	Fracture of lower fourth of tibia	1	..	166	On the 103rd day had an attack of erysipelas, probably from being in an unhealthy room.
4	Fracture of fibula at middle, with injury of tibia	1	..	190	Necrosis of bone (an officer).
5	Fracture, with great comminution lower third of tibia (left), fracture of fibula, posterior tibial artery divided.	1	..	..	Numerous fragments of bone were removed in the first instance, and many others from time to time. At the end of six months, consolidation is yet imperfect. Several sinuses lead to dead bone, and, though the general health is good, recovery must be very slow, if indeed amputation is not necessary.

Fractures of Metatarsal and Phalangeal Bones of the Foot.

*Fractures,
Bones of
Foot.*

Of this description of wounds there have only been seven cases, five of which were eventually invalided; the average period for which the cases were under treatment was under 90 days. The same remarks made respecting injuries of the hand apply here. It rarely happens that a man who has received a bullet through the foot, shattering any of the bones, is again able to do duty as a soldier; on any exertion the foot swells and becomes weak, and the tendons are so often injured that the man is permanently lame. In one case amputation of the toes was found necessary, and the patient was discharged from hospital well in 41 days. One case still remains under treatment.

Wounds with direct Injury of Large Arteries.

*Wounds of
Arteries.*

During the war it has not happened in any case that a man wounded in a large artery has presented himself for treatment. Such wounds, unconnected with fractures, are exceedingly rare. An artery of the first magnitude, as the femoral, when wounded, pours out blood so fast, that in half-a-minute the man may be dead. Smaller arteries, such as the radial or ulnar, may bleed freely at the time of a wound, but commonly (if divided) cease to bleed after the first faintness, though second hæmorrhage from an unsecured artery of this magnitude is pretty common. That a wound of the femoral artery is almost necessarily fatal, will be guessed from the fact of no men so wounded having been seen alive, though three men died on the field of battle from this cause.

Wounds with direct Injury of Large Veins.

*Wounds of
large Veins.*

During the campaign, two instances of this kind of injury have presented themselves, both ending fatally. The cases are instructive.

Number of Case.	Nature of Injury.	Died in Days.	Remarks.
1	Injury to femoral vein, about middle of thigh	18	Death occurred from continued hæmorrhage.
2	Injury to subclavian vein, third stage of course	14	Death occurred from continued hæmorrhage.

The case No. 1 was that of Lieut.-Colonel Austen, 2nd Battalion 14th Regiment, who at the assault on the works at Rangariri, on November 29th, 1863, received a wound from a bullet, which, striking him on the front of the right thigh, four inches below Poupart's ligament, passed obliquely downwards and lodged. Very great venous hæmorrhage came on after the receipt of the wound, welling up from the track of the wound. This was restrained by a tourniquet, which was kept on for upwards of a day. When it was removed the bleeding was found to have ceased, but the leg and thigh were very much swollen and œdematous. It was conjectured that the artery was untouched, as pulsation was perfect in the tibial vessels, and it was thought that the femoral vein was wounded about the middle of its course. The temperature of the foot and leg was normal. Though no blood escaped externally, it continued to extravasate into the tissues of the thigh, and by its putrefactive condition engendered an irritative fever. Unhealthy pus mixed with grumous blood was discharged from the external wound, of a most offensive character. On the morning of his death a sudden hæmorrhage occurred from the wound, followed in about a quarter of an hour by a second similar, from which he sunk.

In the above case it is difficult to say what could have been done to save the patient; probably nothing could. Perhaps a surgeon with experience and with great moral courage might have attempted something by making an incision over part of the vein assumed to be wounded, and have brought the edges of the cut vessel together with a fine thread, or even have ligatured the vein in the ordinary way; but it must be confessed that this procedure is more what one would recommend as a desperate resource than feel inclined to risk whilst the result was still doubtful. After death it was found that the vein was half cut across, and that the artery was intact.

The second case was that of Private Thomas Hammond, 2nd Battalion 18th Regiment, who, in action at Orakau, on the 1st of April, 1864, received a wound by a bullet, which, entering at the outer border of the right scapula, passed obliquely upwards, and crossing the very apex of right side of chest, yet without wounding the lung, emerged over the first rib at a distance of two inches from the sternum. Next day paralysis of the right arm was noticed. On the 12th day from the opening of exit, healthy pus came away, but from the posterior wound (that of entrance) an unhealthy-looking sanguineous discharge issued. There were no chest symptoms. There was an extensive discoloration of the whole of the submaxillary region, and extending as far as the right hypochondrium, the skin being dark, red, shining, and elastic and painful. The patient was pale, anæmic, and could not be raised without danger of syncope. On the 13th day the discoloration about the right side of chest was darker and tenser, and extended lower; he had also become weaker. On the 14th day the skin over the discoloured parts had sphacelated. No hæmorrhage came from the wound, but the evidences of internal bleeding were very evident. The heart's action was fluttering. The respiration was short, hurried, and sudden; he lost all colour, and became pulseless. On this day he died. An examination of the parts showed that the bullet had passed between the artery and the vein; the coats of the artery were not divided, but having been brushed and injured, inflammation had set up, and a clot of fibrinous matter occluded the vessel for an extent of about 3 inches. The vein had given way, probably not quite cut through in the first instance; the extensive sloughing had opened into it, and had caused the syncope noticed on the 12th day. The blood had from the open vein poured out into the sub-

cutaneous cellular tissue of the neck, chest, and abdomen, producing the tense red swelling before spoken of.

Wounds with direct Penetration or Perforation of Large Joints.

Wounds of Joints.

Of this species of injury there have been treated during the campaign 33 cases. As might be expected, wounds of this description have been the cause of nearly all the operative surgery that has been practised. Of the 33 cases, 15 have been submitted to amputation, 10 to excision of the joint. Five of the cases terminated fatally, all after amputation.

The following Table exhibits the cases of wounds of joints :—

Description of Injury.	Number of Cases	Amputations.	Excisions.	Died.	Invalided.	Proportion of Deaths to Cases Treated, per Cent.	Proportion of Cases to Total Wounded, per Cent.
Wounds of shoulder-joint	9	..	9	..	9	15·15	7·13
„ elbow-joint	5	3	1	1	4		
„ carpal joint	9	4	..	..	9
Metacarpo-phalangeal of thumb..	2	2	..	..	2
Wounds of knee-joint	7	3	..	3	4		
„ tarsal joint	1	1	..	1	..		

The success obtained in the treatment of wounded joints is apparent. Exceptional circumstances caused the death of one man of the five who died after being operated on ; but even without making this allowance, the rate of mortality will compare advantageously with similar statistics anywhere.

As in other injuries, the rule has been to interfere as little as possible ; and aided by the excellent health of the men, the exertions of the various surgeons have been rewarded with much success.

Wounds of Shoulder-Joint.

Wounds of Shoulder Joint.

There have been nine cases of this injury, all requiring excision of the head of the humerus, and all recovering after this operation. The remarks to be made about this injury are deferred till the operation itself comes to be spoken of.

Wounds of the Elbow-Joint.

Wounds of Elbow Joint.

Of this injury there have been five cases treated ; three of them were submitted to amputation, of whom one died, another case recovered without operative interference, and one man recovered after excision of the elbow-joint.

The particulars are here shown :—

Number of Case.	Description of Injury.	Resected.	Amputated.	Died.	Recovered.	Remarks.
1	Elbow joint shattered, and the humerus split up. Radial artery divided	..	1	1	..	This man was shot accidentally; he lay out all night bleeding; collapse excessive. He died in 82 hours after operation.
2	Elbow joint and lower end of humerus shattered	..	1	..	1	Wounded also very severely in the other arm.
3	The outer side of elbow joint opened by a bullet	..	..	..	1	Very great constitutional irritation followed, with the formation of numerous abscesses. He recovered with fibrous ankylosis of the joint in 190 days.
4	The bullet passed through the olecranon (left), and destroyed the elbow joint	1	..	..	1	This man underwent resection of the elbow joint; the olecranon, and 4 inches of the shaft of the ulna were removed, and the head of the radius.
5	The right radius and ulna were fractured, the elbow joint completely destroyed, and the humerus splintered nearly up to the upper third	..	1	..	1	Recovered without any bad symptoms after amputation.

In the case of No. 1 death was due to the primary hæmorrhage, not to the shock of the operation; an unfortunate but accidental complication.

In the case No. 3, the bullet in its passage had injured and slightly opened the joint, but not to any material extent; the mischief set up within the joint was severe, but did not lead to a bony ankylosis. Probably something may yet be done by forcible extension in breaking up the strong fibrous adhesions about the joint.

Wounds of the Carpal Joint.

There have been nine instances in which the carpal joint has been shot through (four of them accidental). In four instances amputation of the forearm has been practised on account of the injury, and in five instances the cases have been left alone with a successful result, the joints being ankylosed.

The following Table gives the prominent points about the cases:—

*Wounds of
Carpal Joint.*

No. of Case.	Description of Injury.	Recovered in Days.	Amputated.	Invalided.	Remarks.
1	Bullet through the outer part of the carpal joint, also injury to radius	129	..	1	A considerable number of pieces of bone with cartilage attached came away from the wound. Severe constitutional irritation. The joint ankylosed.
2	Musket bullet through the lower part of the carpal joint. Accidental	92	1	1	Secondary hæmorrhage coming on in the course of the treatment. The forearm was amputated.
3	Bullet striking on palmar surface of hand, passed up towards through carpal joint: exit in forearm, fracturing the radius	73	..	1	Severe constitutional irritation. The wounds readily closed, but the hand had regained no power after 137 days.
4	Through the carpal joint from behind forwards	42	1	1	Amputation on 18th day on account of the constitutional irritation.
5	Bullet passed through the lower part of the carpal joint from palmar to dorsal surface	74	..	1	There was some constitutional irritation, with abscesses. The wound healed well. Wrist-joint ankylosed.
6	The bullet destroyed the carpal joint, and also fractured both radius and ulna	54	1	1	Amputation on the 5th day. An intemperate man. The case was complicated with traumatic delirium.
7	Through right carpal joint, and also injury to radial artery	90	..	1	Numerous pieces of bone came away. Secondary hæmorrhage on 7th and 15th days. Bony ankylosis followed.
8	Accidental discharge of Enfield rifle; bullet passed through the carpal joint, injuring scaphoid bone and semilunar, and fracturing the articular end of radius	..	..	1	Numerous fragments of bone came away, and great constitutional irritation was set up, with extensive suppuration. The wound was unhealed on the 185th day, but was likely soon to close.
9	Gunshot wound (accident) through left carpus and metacarpus, great injury to bones	169	1	1	Great phlegmen and profuse wasting, discharge necessitated amputation above wrist-joint on the 150th day. Wound was healed on 169th day. Much disease of carpal bones and joints was found after operation.

A common surgical bugbear is the notion that, because of its complicated structure, the many bones composing it, and the extent of its synovial lining membrane, the carpal joint, when injured, requires amputation to save the patient's life. This notion is so far true, that if the injury is very extensive, and if the patient's health is not good, there is danger to life from the very great constitutional disturbance invariably set up after such injuries; but the rule is, unquestionably, that a bullet traversing the carpal joint inflicts a wound which may heal of itself. Even in the case of accidental wounds, where there is always, from the proximity of the hand to the muzzle of the gun, much contusion and laceration, such wounds, in a man of good constitution, ought to heal. The intolerable pain resulting from the formation of abscesses during the disengagement of splinters and necrosed bone—abscesses which are confined by the tense resisting fascia of the hand, and of the

tendons about the joint—causes the patient to be urgent in his entreaties to have the limb taken off; but, excepting in really exceptional circumstances, the wound ought to heal, and, at the worst, the case might be kept for a secondary operation. In No. 6 case the carpal joint was literally blown away, and amputation was imperative. When the arteries, radial and ulnar, are divided, of course the necessity of primary amputation may be urgent.

Injury to Metacarpo-Phalangeal Joint of Thumb.

There were two cases of this injury. In both, the joint was destroyed, and the adjoining bones were splintered. Amputation was resorted to in both cases. *Injury to Joint of Thumb.*

Wounds with direct penetration or perforation of the Knee-Joint.

Under this head are included cases in which the wound was made directly into the joint, and those which, in their subsequent process, opened the joint by ulceration. Altogether, seven cases of these forms of injury have presented themselves, the particulars of which are here shown :— *Wounds of Knee Joint.*

Number of Case.	Description of Injury.	Recovered in Days.	Amputated.	Died in Days.	Remarks.
1	Musket bullet lodging in head of tibia; bone split into the knee-joint	..	..	25	Bullet extracted by operation from head of tibia. It was not suspected that the bone was split into the joint. Died from the exhaustion of very profuse suppuration.
2	Bullet slightly injured upper and inner margin of right patella, passed inwards, and lodged in the epiphysis of femur	180	..	..	No constitutional irritation came on for seven days, after which violent febrile disturbance came on, followed by exceedingly profuse suppuration.
3	Bullet entered above outer condyle of femur, traversed it, grooving the bone, and injuring the capsule of joint	87	1	..	No great constitutional disturbance came on for nine days, when profuse suppuration and wasting hectic appeared. Thigh amputated on 31st day.
4	Fragment of hand grenade fractured patella. The joint became affected secondarily	60	1	..	No great constitutional excitement for 22 days, after which profuse suppuration and hectic. Thigh amputated on 2nd day.
5	Bullet fracturing lower third left femur, and splitting the bone into the joint.	107	1	..	A primary amputation which healed rapidly, but subsequently re-opened, and the bone exfoliated.
6	Bullet passed between the head of the fibula and the knee-joint, cracking off a minute piece of the head of tibia, which was lifted up into the joint	..	1	46	No suspicion of injury to joint till 12th day after wound, when matter formed in the knee-joint. Thigh amputated on 20th day from receipt of wound. Sank, on the 46th day, from pyæmia; secondary hæmorrhage had been present.
7	Musket bullet shattering the left femur, and splitting the condyle	..	1	34	An Officer (Ensign Ducrow, 40th Regiment). At first no symptoms of injury of the knee-joint were noticed; but abscesses formed in the thigh and leg, and constitutional irritation became extensive. Amputation was performed on the 13th day. The patient had an attack of secondary hæmorrhage, of which he never recovered. He died 22 days after amputation.

Notwithstanding the occurrence of one case of undoubted penetration of the knee-joint, and lodgment of the bullet within the epiphysis of the femur, which recovered without amputation, the experience of this war confirms the rule laid down by former experience, of the almost necessarily fatal character of such wounds when left without operative interference. It is difficult for an inexperienced person to bring himself to believe that a small wound into the joint, which, for the first week, or even fortnight, excites little or no constitutional irritation, may not prove in his hands a lucky exception: hence an unwillingness to operate in such cases, which it is difficult to overcome; but one of the operations in the above Table was a primary one.

The course of gunshot wounds of the knee-joint has been similar in every instance. At first no great constitutional excitement for a week or more, the pain not immoderate, the discharge trifling; then, almost suddenly, febrile disturbance is set up; abscesses form first of all in the muscles of the thigh, then in the calf of the leg, and lastly pus escapes from the joint; excruciating pain wears out the patient, and the hectic fever and incredibly profuse suppuration would hurry him off, were his fate not averted by amputation. The erosion of cartilage may not be found to be very extensive; it has indeed always appeared to be quite disproportioned to the overwhelming pain, and to the extent of the suppuration. In the instance noted as having recovered without amputation, the case looked so undecided that it was resolved to save the limb. The following are the particulars of it:—

Private John Moffitt, 68th Regiment, was wounded in action at the Gate Pah, on April 29, 1864, by a musket bullet which, striking at the upper and inner surface of the right patella (grazing this bone), passed directly backwards, and lodged, it is supposed, in the expanded end of the femur. It does not appear that any synovial fluid was noticed escaping from the wound, but the finger could be passed into it to a depth of more than two inches. It was presumed that the joint, if injured, was very slightly so. For seven days no constitutional irritation appeared: the man's spirits were good, his pulse tranquil, and the appetite good; but after this period violent inflammatory symptoms came on, abscesses formed in the thigh, and an incredibly profuse suppuration was established; hectic, delirium, and excessive weakness were present; and for many weeks the man's life was despaired of. He was far too weak for amputation to be performed; the joint was enormously swollen, and abscesses formed down the calf of the leg. At length the natural vigour of his constitution triumphed: the fever subsided, the suppuration gradually lessened, disappeared, and in 180 days ankylosis by bony substance had taken place within the joint. The man now has a very useful, though perfectly straight leg.

In the treatment of the above case, the indications to be fulfilled were those of tiding the man over by giving him suitable nourishment, and what would, in any case less severe, have seemed immoderate quantities of stimulants, brandy especially. Large doses of opium were also given; and the abscesses, both round the joint and elsewhere, were thoroughly laid open. It may be noticed that, in cases of doubtful prognosis, the tolerance of large quantities of alcohol and opium is the best indication we can have of a successful issue.

The Medical Officers having the treatment of the case, and who saw it thus brought to a successful issue against all apparent rule, were those on whom the impression was made the strongest, that in another case, precisely similar, the thigh ought to be amputated at once. The ordeal through which this man passed could not be gone through by many men, so that the impression made was, that the rule of amputating, in all cases of gunshot wound into the knee-joint, holds good, and ought not to be lightly discarded.

Wounds with direct penetration of the Tarsal Joint.

Wounds of Tarsal Joint.

But one wound of this nature has been treated. In this the bullet, entering between the metatarsal bones of the great and second toes (left foot), passed obliquely downwards and backwards, emerging under the arch of the foot, having, in its course through the tarsal joint, injured it and the cuneiform and ocapoid bones. The record of the case states that it was necessary to amputate on the 13th day after receipt of injury, and this was performed at

lower third of leg. No reason is given for the preference of this operation to that of Syme's operation, or some modification of it. Five days after operation, hæmorrhage from the stump came on, and the flaps were opened out. Seven days after operation, as the flaps were sloughing, a re-amputation at the lower third of the thigh was performed. The man died on the third day from the second amputation.

Number of Case.	Description of Injury.	Amputated.	Died.	Remarks.
1	Musket bullet through the left tarsal joint	1	21 days after injury.	Amputation at lower third of leg, followed by amputation of lower third of thigh.

Wounds with direct Injury of Large Nerves.

The complication of injury to nerves in wounds of all kinds is of course very common ; more or less damage of the parts in the neighbourhood accompanies every wound, but slight lesions of nerves, that is division of branches, as distinguished from main trunks of nerves, give no trouble: they heal nearly as rapidly as other tissues, and sensation gradually returns. Sometimes, especially if the nerve has been more bruised than cut, neuralgic pains are felt long after the wound has cicatrized. It is presumable, however, that after a time such pains disappear. When the main trunk of a particular nerve is cut or greatly injured, not only numbness, but also loss of power, occurs in the parts supplied with nervous influence by it. This has happened in four instances in this war. All required to be invalided on this account.

The particulars of these cases are given in the following Table :—

Nature of Injury.	Wounds Treated.	Invalided.	Duty.	Healed in Days.	Proportion of Cases to Total Wounded, per Cent.	Remarks.
a. Wound of crural nerve, middle of thigh	3	3	..	$\left\{ \begin{array}{l} 41 \\ 60 \\ 56 \end{array} \right.$	} 1.03	The external wounds healed in the number of days stated, but the special symptoms of wounded nerve remained permanent.
b. Wound of brachial plexus	1	1	..	72		
c. Wound of ulna nerve	1	..	1	40		

In addition to the very palpable effects presented by the loss of power over the muscles, and loss of sensation, a limb having a main nerve injured presents a distinctive appearance which is present only in such cases. The limb loses bulk, and the fingers or toes, as the case may be, become smooth, bluish coloured, and remarkably tapering. Of the five cases noted above, the three first were cases favourable for ultimate recovery. The nerve had been completely divided, and might, probably would, unite, and after a while nervous influence would be re-established ; but the case of wound of brachial plexus is not so encouraging. The nerve had been apparently crushed or bruised, rather than cut, and the loss of power went on gradually increasing. Instead of anæsthesia, this man suffered from greatly heightened sensibility in the parts and the prognosis, as to his eventually regaining the use of his arm, was doubtful. The case of wound of ulnar nerve promised to do well.

*Invaliding on account of Injuries received in the Campaign.**Invaliding.*

It is not possible accurately to record the amount of invaliding which has, during the war, been due to causes solely referable to the exceptional circumstances of the campaign. The injuries received in battle, which caused invaliding, have already been tabulated; but there were likewise many men invalided besides those whose wounds were received in battle, who became disabled from exposure and accidents. Slight wounds also were allowed to incline the balance occasionally towards invaliding, in men suffering from illness from natural causes, or who were near the end of their period of service, so that, on the whole, any attempted enumeration of the disabilities which caused the invaliding in this campaign would be misleading, and therefore worthless.

*Operations.**Operations.*

From the preceding Tables it will have been seen that the operations necessary after wounds received in this campaign have been comparatively few; but though this has been the case, one class of injuries, that of wounds of joints, has been of exceptionally frequent occurrence, and has necessitated the performance of an operation—namely, resection of the head of the humerus—so frequently as to make it quite the peculiarity of the surgical history of the war. This operation has been performed nine times.

The success of the operations performed during this war has been very gratifying. Of 26 capital operations, but four have been lost, giving the low rate of mortality 15·4 per cent. of the operations performed. Whilst not overlooking the influence on mortality of a good hygienic condition of the hospitals where the operations were undertaken, it is necessary to assign the chief credit of this success to the fact of the wounded men being at the time in excellent physical condition. In two of the cases which proved fatal after operation, one of the thigh and one of the arm, there were special circumstances to account for the termination.

*Amputation of the Arm.**Amputation of Arm.*

This operation has been performed in four cases. In all the primary injury consisted of extensively comminuted fracture of the humerus from gunshot, complicated in two cases with injury of elbow-joint. One case proved fatal. The man in this instance was wounded accidentally, and lay all night by the roadside bleeding. He was greatly reduced by the hæmorrhage, to lowered vitality, from which must in fairness be attributed his death.

The following Table exhibits the particulars of the cases:—

Number of Case.	Nature of Injury.	Primary.	Result.		Ratio of Deaths to Operations, per Cent.	Remarks.
			Cured.	Died.		
1	Compound fracture of humerus, with much splintering	1	Days. 72	Dys. ..	25	Had also a severe wound in muscles, left forearm. Middle of humerus.
2	Ditto, with injury of elbow-joint	1	57	..		Middle of humerus.
3	Compound fracture of humerus, with much splintering, and injury of elbow-joint	1	..	4	..	Greatly exhausted by primary hæmorrhage, to which cause death was due.
4	Fracture of radius, destruction of elbow-joint, and fracture of humerus	1	43	..	..	Upper third of humerus.

Amputation of Forearm.

This operation has been performed only four times. The following Table gives the particulars :—

Amputation of Forearm.

Number of Case.	Nature of Injury.	Operations Performed, Secondary.	Cured in Days.	Proportion of Deaths to Operations, per Cent.	Remarks.
1	Gunshot injury to carpal joint, with fracture of radius and ulna	1	54	0	Amputation on 5th day, secondary hæmorrhage from stump, and had an attack of traumatic delirium
2	Gunshot injury to carpal joint	1	92		Secondary hæmorrhage from the original wound caused the forearm to be amputated.
3	Gunshot injury to carpal joint	1	42		Amputated on 18th day.
4	Severe gunshot injury of carpus and meta-carpus	1	169		Profuse discharge and inflammation necessitated amputation of the forearm on the 150th day.

Amputation of the Thumb.

This operation has only been had recourse to twice.

*Amputation Thumb.**Amputation of Fingers.*

This operation has been performed seven times on four men.

*Amputation Fingers.**Amputation of the Thigh.*

This operation has been performed six times, of which three were successful and three died.

Amputation Thigh.

Number of Case.	Nature of Injury.	Nature of Operation.		Place.	Result.		Proportion of Deaths to Operations per Cent.	Remarks.
		Primary.	Secondary.		Cured.	Died.		
1	Gunshot fracture of condyle of femur, with knee-joint	...	1	Middle	56	...	50	Amputated 31st day, middle of thigh.
2	Gunshot fracture of patella; knee-joint subsequently implicated	...	1	Lower Third	25	...		Amputation on 52nd day, lower third of thigh. The leg was first of all removed through knee joint.
	Gunshot fracture of lower third of femur, with splitting into knee-joint	1	...	Middle	107	...		Amputated 2nd day, at middle of thigh. The end of bone subsequently necrosed.
	Gunshot fracture of femur, lower third, and through condyles	...	1	Lower Third	...	34		Amputation on 13th day, lower third of thigh. Had secondary hæmorrhage. Died from pyæmic poisoning.
5	Gunshot fracture of head of tibia into the knee-joint	...	1	Ditto	...	46		Abscess in the knee-joint. Required amputation on 20th day. Died on 46th day. After operation had secondary hæmorrhage. Sank from pyæmia.
6	Gunshot injury of tarsal joint	...	1	Ditto	...	21		A re-amputation at lower third of thigh, on account of secondary hæmorrhage after amputation at lower third of leg.

Of the above operations little requires to be said. Three of them were performed in the usual manner, with antero-posterior flaps. One case (No. 2 in the Table) may be said to have had a double amputation, as the leg was first severed at the knee-joint, the intention being to take a long posterior flap from the muscles of the calf of the leg; but the structures of the calf of the leg were found to be so thoroughly disintegrated from the burrowing of abscesses that no flap could be taken from them; consequently the knife was carried higher up, and instead of a long posterior flap, a long anterior one was taken, and a sort of modified "Teale's" operation resulted. An excellent covering was obtained, and the stump was substantially healed in 14 days.

In No. 4, fatal case, death resulted from pyæmia poisoning. Secondary hæmorrhage also came on in this case, that of an officer (Ensign Ducrow, of the 40th Regiment) wounded at the assault on the Maori works at Rangariri. In No. 5 case, an injury of the knee-joint, the patient had, after the operation, secondary hæmorrhage, and subsequently pyæmia. In No. 6 case, the original injury was injury to the tarsal joint, for which the leg was amputated at the lower third, and subsequently re-amputated at the lower third of the thigh.

Amputation of the Leg.

Amputation of Leg.

This operation has been performed on two occasions. Both were successful.

No. of Case.	Nature of Injury.	Primary Operation.	Cured in Days.	Rate of Deaths to Operations.	Remarks.
1	{ Right Tibia and Fibular shattered by bullet; artery injured }	1	158	{ 0 }	{ Suffered from secondary hæmorrhage; the end of Fibia necrosed. Flaps inclined to slough. }
2		1	88		

Both of the above operations were performed by the method of a semi-circular incision in front, with one posterior flap. The first case deserves record, as showing wonderful tenacity of life after accumulated accidents, under which nine men out of ten would have succumbed.

Private Martin Walsh, 43rd Regiment, was wounded by a musket shot at the assault on the Gate Pah, April 29, 1864. The bullet caused extensive shattering of both the tibia and fibula of the right leg, lacerated the muscles, and injured the artery and nerve. The leg was amputated at the upper third within 24 hours. The patient lost a great deal of blood prior to and at the operation. He was rendered very weak; his appearance exsanguine in a marked degree. The stump sloughed, the posterior flap fell away from the front, and about one and a half inches of the sawn end of the tibia protruded. Much constitutional irritation ensued, the rigors were frequent, and as marked as those of the cold stage of an ague fit. Abscesses formed in the course of the lymphatics, along inner border of thigh. On the 26th day after the operation, profuse secondary hæmorrhage came on from the stump, and recurred a few hours afterwards to such an extent that it was necessary to tie the femoral artery in the upper part of its course. This proceeding proved effectual for the permanent arrest of the bleeding. Necrosis of the protruded part of the tibia took place, a ring of bone came away, and the patient hovered between death and life for some time, although a vigorous attempt at repair took place, and the stump cicatrized to a mere point. After proceeding so far well, the man unluckily fell whilst walking about on crutches, and striking the end of the stump on the ground, the cicatrix became inflamed and reopened. Eventually union and granulation again took place, and the man was sent to India (at his own request), an invalid, with the stump healed and himself in good health.

The second case presented no points of interest.

Amputation of the Toes.

This operation was performed in one case where all the toes of one foot were injured by a musket bullet.

Excision of the Head of the Humerus.

During the war this operation has been performed nine times on account of gun-shot fracture of the head of the humerus, either with penetration of the joint in the first instance, or on account of secondary implication of the joint, resulting from fracture close to it. In no instance has death followed, and in all the cases it has proved in the highest degree successful. The wounds made in the operation have healed well and sufficiently soon, and useful limbs have been retained. In the first case, owing to some constitutional peculiarity, and perhaps to some unsuspected length to which the fissuring in the shaft of the humerus extended, the healing of the wound has been delayed; but there is no doubt of the operation also being eventually successful.

*Resection of
Head of
Humerus.*

"The frequency of the occurrence of wounds shattering the head of the humerus, and the necessity thus arising for operative interference, has constituted the most peculiar and special feature of the hospital practice here. There is no doubt but that a few years ago all the limbs thus injured would have been amputated at the shoulder-joint; and as little that, instead of the small mortality from operations which I have recorded as occurring in this war, that a much larger per-centage would have fallen to be noted. Resection of injured joints cannot be called a new operation; but it is still one which, compared with the ruder proceeding of amputation, is one of a comparative novelty, and thus a record of the cases in which it has been performed is not without its value, and therefore the following remarks, made after a careful perusal of the subjects of the operation recorded in the hospital books, and a personal acquaintance with the details of all the cases during the course of their treatment, may be permissible.

"Eight of the operations were secondary ones, performed after the coming on of much swelling and the occurrence of severe febrile disturbance. One operation only was performed within 24 hours after the receipt of the injury.

The following Table exhibits a Synopsis of the Nine Cases treated during the New Zealand War, 1863-65:—

Regiment.	Regtl. No.	Rank and Name.	Age.	Service.	Nature of Injury.	Length of parts resected.	Interval in Days between Wound and Operation.	Operation.	Operator.	Cure.	Remarks.
R.N.	..	Lieut. H. Alexander	29	..	Transverse fracture of right humerus, half an inch below surgical neck. Upper fragment fissured perpendicularly into joint, and displaced on to dorsum of scapula. Several fragments also detached from head of bone	3	Days. Hrs. 22 0	Resection of head of humerus	Surgeon W. A. Mackinnon, C.B., 57th Foot	Cure.	Wound unhealed ten months after operation; numerous abscesses formed. Fourteen months after operation Mr. Paget writes—"There is considerable thickening about shaft of humerus, supuration has ceased, the soft parts appear sound, and I can scarcely doubt the case will end with a good recovery."
65th	3164	Private Andrew Law	37	19	Fracture of neck of right humerus, with great shattering of head of bone and portion of shaft. Long tendon of biceps divided by bullet	3	20 0	"	"	"	One year after flexion of arm, tolerable, extension imperfect; all other motions of limb good. Power of deltoid anterior to operation wound most injured.
40th	273	Corp. Nicholas Holmberg	27	5	Fracture of neck of right humerus, fissuring it vertically into joint and downwards from point of impact (great tuberosity). Spicule of bone coming away aided in diagnosing injury	2½	21 0	"	Staff Asst-Surgeon C. C. Dempster	"	After nine months, motions of forearm and hand almost perfect. Could flex forearm on arm so as to reach sternal end of clavicle. Abscesses formed in supra-spinous fossa subsequent to operation.
"	3793	Private Thomas Grimes	26	8	Fracture of head of left humerus from shaft, ball struck great tuberosity, from which three fissures radiated; long tendon of biceps lacerated	2½	15 0	Resection of head of humerus and fissured part of shaft	Surgeon W. A. Mackinnon, C.B., 57th Foot	"	Little power of arm eight months after wound. Flexion of forearm and power of hand satisfactory. The arm had been kept too long bandaged to side on board ship.

Synopsis of the Nine Cases treated during the New Zealand War, 1863-65—continued.

Regiment.	Regtl. No.	Rank and Name.	Age.	Service.	Nature of Injury.	Length of parts resected.	Interval in Days between Wound and Operation.	Operation.	Operator.	Result.	Remarks.
1st Bat. 12th	3308	Private John Doward	23	9	Ball penetrated below anatomical neck of right humerus, and lodged in shaft behind and opposite bicipital groove; long tendon of biceps uninjured. Head of bone entire	Inches. 2 $\frac{3}{4}$	Days. Hrs. 18 0	Resection of head of humerus. Sequesters of bone extracted	Surgeon W. A. Mackinnon, C.B., 57th Foot	Cure.	Great constitutional disturbance after operation, and abscesses formed at back of arm. Eight months after operation small sequestrum removed from wound of entrance, another portion came from operation wound. Power of forearm and hand good, but of arm still imperfect. Progress retarded by too long continuance of bandaging limb to side.
2nd Bat. 14th	697	Private John Hannigan	26	5	Fracture of neck of left humerus, with splintering of the shaft into numerous fragments. Ball lodged beneath the inferior angle of scapula and was removed eight months after	3 $\frac{1}{2}$	13 0	Resection of head of humerus and portion of shaft	Insp.-Gen. Mouat, C.B., V.C.	"	Great difficulty in removing head of bone from glenoid cavity. Abscesses formed in arm and about scapula, sequestra removed eleven months after; some power of motion of arm one year after, and power of hand and forearm good.
1st Bat. 12th	260	Private James Yates	22	4	Fracture of head and neck of left humerus, with fissure of upper part of shaft, long tendon of biceps destroyed, bullet extracted from beneath skin over first dorsal spinous process	2	21 0	Resection of head of humerus	Surgeon W. A. Mackinnon, C.B., 57th Foot	"	Some pneumonic symptoms existed at first. Abscess formed at lower part of neck. Nine months after had tolerable use of forearm. Progress retarded by bandaging limb too long to the side on board ship.
43rd...	612	Private John Bryant	26	6	Fracture of head of right humerus into joint, acromion process of scapula injured, long tendon of biceps lacerated	1 $\frac{1}{2}$	21 0	"	"	"	Much reduced by discharges before operation. On invaliding home five months after operation health was good, wound healed, but he had not yet regained much power in the limb. Wound completely healed seven months after. Could raise hand to mouth and use the hand and forearm fairly.
50th...	159	Private George Box	28	7	Fracture of head of left humerus, ball impacted in bone at outer and back part of head just below the anatomical neck; fissures extended into joint. Long tendon of biceps uninjured	2	0 19	"	Staff Surgeon Home, V.C.	"	

"In only two of the nine cases were any suspicions entertained that the joints were injured when examined on the field, or immediately after reception into hospital, even where the head of the bone was shattered into fragments. Though alive to the necessity existing to determine the question, the remark used in all the cases is that no *crepitus* was distinguishable; the first symptom which drew attention to the true nature of the case in every instance was the discharge from the wound of the peculiar yellow coloured grunous matter characteristic of such injuries being the altered synovial secretion mixed with products of inflammation. I apprehend that the great majority of operations for gunshot fracture of the head of the humerus are likely to be secondary or intermediary ones. The diagnosis is not an easy one, whatever may be the theoretical facility for discrimination, and, in the uncertainty as to whether the joint is really perforated or not, the patient is pretty sure to have given him the benefit of the doubt. That delay is attended with no risk in shoulder-joint cases, the records of the eight cases successfully operated on here goes far to prove; and I should even be inclined to say that all cases of wounds of shoulder-joints (excepting the most palpable) should be left for secondary operation.

"In none of the cases did any vessels require ligation; but in several instances much venous oozing occurred within the first two hours, rendering it necessary to plug the wound with lint steeped in some styptic fluid. It is satisfactory to know that in this operation the dangers of secondary hæmorrhage are eliminated.

"The formation of abscesses after operation and before cicatrization has taken place is not uncommon, the cause being the loosening of a spicula of bone from the shaft and the irritation kept up by the efforts made for its extrusion. The appearances presented by the limb, and the accompanying sympathetic fever may mislead into the belief that there is periosteal inflammation of the shaft of the bone for its entire length, the pain being intense, and the arm uniformly swollen; the swelling being smooth, hard, and equal at every part of the arm. After the extrusion of a small spicula all the above symptoms and appearances disappear, and nothing formidable ensues.

"The wounds left by the operation heal irregularly, being, as it were, bridged over by granulations at different points."

The above observations are extracted from the Annual Report of the Medical Officer in charge of the Field Hospital at Queen's Redoubt. The seem to embody most of the particulars bearing on the operations. The cases themselves are too numerous to be recorded here, but are given in a tabular form on pages 516 and 517.

The operation performed in all the nine cases was that by one straight incision, Langenbeck's, commencing over the head of the joint, in the spot between the coracoid process and the acromion process of scapula, carried down the desired length (usually $3\frac{1}{2}$ to $4\frac{1}{2}$ inches) in a straight line through the inner border of the deltoid muscle to the bone; the long tendon of the biceps was then sought for and, if uninjured by the bullet, and therefore worth preserving, was dragged out of the bicipital groove and held to the inner side whilst the head of the bone, notched first outwards and then inwards, permitted the capsular ligament to be divided by two straight or slightly bent incisions. In cases where there was much shattering of the bone, the latter steps were correspondingly difficult; the head of the humerus had, as it were, to be quarried out of the glenoid cavity. Lion forceps were very useful in such cases in seizing and steadying the fragments.

It cannot be said that there is any essential after treatment. The dictates of common sense are applicable here, as in everything else. It has been here the custom, after the operation, to confine the arm to the body by the means of a flannel roller, and to support the forearm with a sling. The wound having commonly a posterior opening where the bullet has made its exit, the discharges escape freely enough; but, as the patient may be allowed soon after the operation to recline in bed, the discharge can thus readily escape by gravitation downwards.

Resection, it has already been remarked cannot be considered in any way novel or recent. It does not appear, however, to have so completely taken its proper place in the acknowledged practice of military surgery as

almost to supersede, as it ought to, amputation at the shoulder-joint for gun-shot injuries to this articulation involving the bone without destruction of soft parts. Larrey's operations, I believe, consisted chiefly in removing fragments and splinters, rather than complete excision. Mr. Hennen, however, states, in his "Military Surgery," that he had never seen this operation performed in the field, and only once in hospital practice; and he thus sums up his notions on the operation in question—"Upon the whole, I am inclined to think that the excision of the head of the humerus will be found to be an operation more imposing in the closet than generally applicable in the field." Our experience, both in the Crimea and New Zealand, contradicts this.

When the very serious nature of amputation at the shoulder-joint is taken into consideration, there cannot be a question that the encouraging results of the excisions performed in New Zealand will lead to the more general adoption of this practice in military surgery for injuries of the shoulder-joint. It must be remarked that gun-shot wounds of bone, complicated with injury to the joints, are about the most dangerous cases we have to deal with, and the general adoption of an operation so comparatively easy and safe, must be hailed as an advance in military practice. It is useless to waste time and endanger the patient's life, or protract his sufferings, after the discovery of the exact character of the injury, and this brings me to the subject of the diagnosis. I cannot do better than refer to the best living authority on this subject, Dr. Esmarch. That able and distinguished military surgeon observes:—

"The diagnosis in such cases is often extraordinarily difficult, even with considerable comminution of the bone." This difficulty was also acknowledged by Larrey and Guthrie. I do not mention this as an excuse for not discovering the exact nature of the injury on the field. All the cases referred to accidentally fell to the lot of two or three young assistant surgeons, who made the primary examination and applied the first dressings on the field, and who neglected to make a digital examination, which would have doubtless led to the detection of the injury to the joint. When next seen after removal from the field to hospital, the pain and tumefaction were too great to admit of a decided and satisfactory examination. The delay, however, is unimportant, as it would appear that secondary operations are quite as successful in their results as primary ones. The principle laid down by Larrey and Guthrie, that resection of the shoulder should only be performed when the head of the humerus is injured, is contrary to the experience of the Prussian surgeons Esmarch and Stromeyer, and notably so in our own cases, in all of which the shaft of the bones were more or less fractured and fissured, in one case to the extent of at least four inches; the bone being broken completely across in a line with, and so close to, the neck of the glenoid cavity, as not even to offer a hold to the Lyon forceps, and the head had to be dissected out with considerable difficulty.

With regard to the operation—that known as Langenbeck's—a single long straight incision was the one adopted. It is the simplest, is in accordance with the first principles of surgery, and should be the operation performed in all gun-shot injuries of the joint with an anterior and posterior opening. Baron Stromeyer has introduced another method from behind, which may be adopted when there is only an opening in front, as it favours the escape of matter and prevents the formation of abscesses, and perhaps sinuses or pyæmia. I consider the transverse incision across the deltoid, not only opposed to surgical rules, but complicates the after treatment and results, from the gaping of the wound and possible loss of muscular power. Frank's method was not tried, as the object of it can be obtained, viz., access to the head of the bone when separated from the shaft, by Lyon forceps.

Surgeon Mackinnon, 57th Regiment, who operated most frequently, remarks:—

"That the excision must not, in the first instance, be carried too high, as there is danger of cutting into the acromio clavicular articulation. The excision can always be extended gradually upwards, and no doubt the higher up the parts are divided, the greater will be the facility of disarticulating the head of the humerus—by no means an easy process when the bone is broken off close to the glenoid cavity, and has to be literally scooped out. In order

more easily to expose the tendon of the biceps, if it cannot be readily got at, the coracohumeral and glenoid ligaments should first be slit up with special care, so as to avoid the long head of the biceps before it is properly exposed to view.

"As to the conservation of the long head of the biceps, I think its preservation is not, after all, a matter of much import, as the subsequent inflammation and consolidation of tissues which occurs after the operation of resection so binds down and fixes the tendon as to prevent its free play consequent on the synovial membrane, which is reflected round the long tendon of the biceps down its groove in the normal condition, and which facilitates its play, becoming adherent and limited in its action."

Condition of the Shoulder after Operation and when the Wounds are Healed.

In some cases the deltoid muscle appeared shrunk or atrophied, and consolidated to the newly formed articular capsule.

The atrophy of the deltoid muscle, which appears to be usual after resection of the shoulder-joint, is probably occasioned by division of the superficial nerves and vessels of the muscle at the time of operation, in which proceeding branches of the anterior circumflex artery, the bicipital and supra scapular are unavoidably severed, the nerves cut across being some unimportant branches of the external cutaneous. The small arteries rarely require ligature, as pressure with the finger or torsion were nearly always found sufficient to arrest hæmorrhage.

The instruments required in this operation are few and simple, viz., two copper spatulas, a saw, a strong knife—blunt pointed, a probe, and Lion or Ferguson's forceps.

*Excision of
the Elbow
Joint.*

Excision of the Elbow-Joint.

This operation has been performed only once during the war. The comparative infrequency of its performance is due to the fact that in most injuries of the elbow-joint the humerus was also extensively splintered, and amputation was necessary.

Number of Case.	Nature of Injury.	Primary Operation.	Result.	Remarks.
1	Musket-bullet passing through the olecranon, left arm, shattering it and about 4 inches of the ulna.	1	Cured in 97 days	The left elbow-joint was in this case destroyed, but the injury was confined to the ulna, the olecranon, and 4 inches of the shaft of which were removed. The head of the radius was also sawn off, to admit of better adaptation. The humerus was not touched.

*Deligation of
Arteries.*

Deligation of Arteries.

On two occasions only has it been necessary to resort to this operation on account of injuries received in battle during the war; both were secondary, unless the term intermediary be preferred to describe the first case; one in which bleeding took place not from ulcerative action properly so called. The arteries operated on were—

- (a) Common carotid (right side of neck).
- (b) Common femoral (right thigh).

Number of Case.	Nature of Injury requiring Deligation of Artery.	Days after primary injury on which performed.	Result, Cured in Days.	Remarks.
1	Compound fracture of lower maxilla, with hæmorrhage from inferior ductal artery	10	91	Ligature came away on 8th day. Abscess formed in neck, from which profuse and repeated hæmorrhage came, owing to ulcerative action on the arteries and veins implicated in the abscess.
2	Amputation of right leg, followed by sloughing of stump and hæmorrhage from the anterior tibial artery	26	45	Ligature came away on 35th day.

The first case, that in which the common carotid artery of the right side of neck was tied on account of bleeding, chiefly from the inferior maxillary artery, is well worth record, as it has been, surgically speaking, the most interesting case occurring during the campaign, and the most instructive.

Private John Livesay, 43rd Regiment, at the assault on the Gate Pah, April 29, 1864, received a wound from a musket-bullet, which shattered the right side of the lower jaw into fragments. Three days after injury hæmorrhage came on, and recurred from time to time within the next seven days, each time more profusely. The bleeding was traced to the inferior maxillary artery within the mouth. The artery had been injured, but, being in a bony canal, could not contract. Every plan was tried to arrest the hæmorrhage permanently, by clearing away fragments, and endeavouring to plug the exact spot where the flux of blood came from. All proved ineffectual, and, on the night of the tenth day, it was necessary, owing to the critical state of the patient, to tie the common carotid of the right side. This proceeding effectually arrested the bleeding. The wound made in the operation healed rapidly, all except one portion about half an inch long, which refused to cicatrize; pus followed from this part of the wound, and, from the fungoid granulations, it was evident that some sufficient cause existed for its non-closure. The ligature had come away on the eighth day. The non-closure of the wound was due to an abscess which had formed at the root of the neck, near the clavicle, and under the sternomastoid muscle, the matter from which escaped by the wound made during the operation in the neck. On the 75th day after the wound (65 days after operation) profuse hæmorrhage came on by the wound in the neck, and recurred, with various degrees of violence, till the 91st day. The bleeding was always easily arrested by pressure, and was unquestionably due to the successively attacked arteries and veins within the crater of the abscess taking on ulcerative action. When an opening was thus made in a vessel, bleeding took place, stopped for a time spontaneously, when the patient became faint, and finally ceased when the ulcerative process had completely eaten through the vessel, thus allowing the ends to contract. The case was exceedingly instructive, on account of the difficulty of carrying out any rational plan of treatment. The patient seemed likely at one time to succumb to the violence of the hæmorrhage. Previously to every recurrence of bleeding, he had a well marked rigor, after which violent pulsation occurred in the neighbouring arteries and in the collateral circulation, enlarged by the closure of the common carotid. The treatment adopted was that of attempting to make a counter opening for the escape of the matter more readily; the attempt, however, failed, owing to the alarming hæmorrhage which took place in a portion of the parts near the end of the neck, but in the process the sac of the abscess was roughly stirred by a director intro-

duced through the wound as a guide to the site, and this seemed a benefit. At least, after the attempted operation, the abscess contracted and the wound healed soundly in 104 days from the receipt of the gunshot injury.

There were no very peculiar symptoms caused by the ligature of the carotid in the first instance. The circulation was carried on by the collateral branches very rapidly, as the temporal artery at the right side was pulsating well 10 minutes after the operation. The man felt for a fortnight very dizzy, but not sleepy; his temper became peevish, but at present he is in every way well and strong.

In the second case, the common femoral artery was tied about $3\frac{1}{2}$ inches from Poupart's ligament, an operation necessary on account of violent secondary hæmorrhage occurring 26 days after amputation of the right leg. The only point worth notice in this case was the recurrence of a pretty copious venous hæmorrhage just after the ligature was placed on the artery. Several of the bystanders at once said that the vein accompanying the artery had been wounded, and indeed it looked very like it, but the bleeding proved to be due to some small vein, and did not recur.

Extraction of Bullets.

Extraction of Bullets.

This proceeding has been resorted to in 43 cases. It is hardly necessary to make any remarks on so simple an operation. Common sense tells us that it is necessary to remove such bodies as soon as possible, if it can be done without too much interference. In certain cases bullets cannot be removed; they are too deep. Such cases must be left alone, and it is seldom that the bullet does not travel along the track of the wound to within reach. There were about 20 cases in which it was presumed that the bullet had lodged, in which the wounds closed without their being extracted. In some of these cases it may be considered doubtful whether the bullet had lodged in reality; in other cases, the injury had been inflicted by slugs, causing no great irritation.

Treatment, by Forcible Extension, of Contraction of Muscles and Fascia, following Gunshot Wounds.

Forcible Extension.

In six cases this practice has been put in operation, and with very good results. Care has been taken not to put the plan in use in instances of freshly united bone, where the necessary force might jeopardize the recently-consolidated callus; nor has it been thought proper to tear up, by forcible extension, the contractions formed in consequence of the union of divided tendons; such cases do not admit of the procedure. In the six cases operated on, the contraction was due to adhesions of the fasciæ, or to disuse of the muscles, which had been long left in one position; as in that where the arm and forearm had been kept at right angles for months, during the treatment of a wound through the muscles of the forearm. In no instance has any harm happened from the use of forcible extension under chloroform, although it has been necessary to employ a very considerable degree of force to tear up old and partially organized adhesions. The pain felt after forcible extensions for some days is severe, but no injury to nerves has been noticed. The pain subsides of itself, and the straightened limb can be used with an inconvenience gradually lessening, till at length none is felt. In four of the cases treated, the cure was complete; the patients, who otherwise must have been invalided for contractions of the arm and forearm, were, after the operation, sent back to their duty. In another case, complicated with fracture which had united, the measure was very useful, but success was not expected to be complete, nor was it. In the sixth case the contraction of the hamstring muscles was not sufficiently overcome to produce a successful result.

In forcibly extending contracted limbs, it will be found that they yield very gradually. The force ought to be continuous—never jerking; and, before commencing, the patient ought to be completely narcotized; a condition of half narcotism makes the operation one of great difficulty.

Treatment of simple Flesh Wounds by closing up the Orifices, and approximating the incised Edges of sound Skin.

The Director-General having transmitted to this country a Report of a new procedure for the treatment of simple flesh wounds inflicted by bullets, in which the originator, Dr. Chisholm, the Surgeon-General of the Confederate States' Army, claimed to cure such wounds in a few days, copies of the paper and the necessary instructions were circulated amongst the Medical Officers in New Zealand, who were requested, should they not object, to try the plan on any favourable cases coming under their notice. The following are the observations of Staff-Surgeon A. D. Home, V.C., on the subject:—

"Dr. Chisholm's procedure for the treatment of simple flesh wounds (by bullets) aims at converting the wound into a closed track, in which air being excluded, putrefactive decomposition of the bruised tissues is said not to ensue, and the sides of the track are said to adhere together, and to unite in fact by the first intention. From a careful reading of Dr. Chisholm's paper, I do not gather that he has himself seen this occur, so much as I gather that it is a process of deductive reasoning applied to the subject of simple bullet flesh wounds. No cases are cited at least. The fact is stated as notorious.

"The steps necessary to close up the orifices of entrance and of exit are the following:—1st. Elliptical incisions are to be made, which must include all the injured skin, which is then dissected away. 2nd. The edges of the incisions thus made are dissected back a little, so as to make them less adherent. 3rd. The edges are brought together accurately, and kept so by the use of a sufficient number of sutures. 4th. A light bandage is passed round the limb, or other part, so as to keep the wound quiet and the sides of the track together.

"That the theory of the above operation runs violently contrary to all the former notions on the subject of gunshot wounds of muscles is true, but this is nothing to the point. All the recorded improvements in surgical procedure have seemed unreasonable, and indeed monstrous, when first announced.

"During the Wanganui campaign I was very anxious to try the new treatment in any suitable cases, but I was only able to find one case in which it would be applicable. In that case it totally failed; the wound sloughed in the ordinary way, and then healed by granulation.

"In a second case, which seemed an eminently favourable one, just as the operation was about to be commenced, the bullet (not before noticed) was examined, and was found to be scored from contact with bone. Such a case was not a fair one to try the operation on.

"During the action at Nukumarū, several very favourable cases for trial of the operation came under notice; but the length of time consumed in (a) giving chloroform, (b) in making careful incisions and dissecting back skin, (c) in applying harelip needle sutures, would not, one case with another, average less than 30 minutes—too much time to be spent over such cases."

My own wish is to try the procedure on a number of suitable cases, so as to be able to speak decisively of its value; but at present I do not think favourably of it for these reasons:—

1st. The difficulty of selecting only suitable cases. If the treatment does no good, it must do harm; and the most experienced surgeons can, after all, only guess whether a bullet, in its passage through a limb, has simply injured the muscles, and has not brushed the periosteum of bone, or cut a large nerve, or divided an artery.

2nd. The length of time required for the occlusion of the openings of entrance and exit are, in my opinion, fatal to the use of it in the field of battle, whatever may be its use in cases where there is plenty of time, to give the wound more than ordinary attention.

It is worth while remarking here on the subject of chloroform, that it is very desirable some apparatus for its administration, of approved convenience and safety, should be supplied. The waste of chloroform in the usual method, simply by pouring it on a piece of lint, is very great, and would be exceedingly

inconvenient were there many wounded. The conditions under which chloroform is administered in the field differ from those in which it is given in stationary hospitals. When given in the open air, or in a tent, the wind carries away the vapour; and it is nothing unusual to see two ounces of chloroform expended before anæsthesia is induced. Though economical considerations of course have a certain weight, the chief value of an apparatus would be the greater ease and certainty with which patients might be brought under the influence of the chloroform. Accidents from administration of chloroform are just as likely to occur in one method as in the other.

Wounded Maori Prisoners.

In order to complete a history of the medical concerns of this war, it remains for me to give some account of the wounded of the enemy who fell into our hands after the various engagements.

The native inhabitants of New Zealand term themselves "Maori," which literally means native, as contradistinguished from "Pakeha," or stranger. It is believed that within comparatively recent times, not much over three hundred years, the ancestors of the Maoris emigrated to the New Zealand Islands from islands in the Pacific. Their own traditions are clear and consistent on this point; and if there were any doubts in the matter, they would be dispelled by a consideration of the similarities in point of language, customs, and physical appearance of the South Sea Islanders and the Maoris: ethnologically they belong to the same race—the Malay. Living in a healthy and temperate climate, with abundance and great variety of food, the Maoris have attained to a physical development far outstripping that of their Malay progenitors; whilst in point of mental endowment, it is questionable if, with equal cultivation, their capacity for intellectual attainments would fall short of those of the average European. In stature the Maoris are commonly tall, hard set, and robust in appearance. Their movements are rapid; and an intelligent curiosity is a marked feature in their characters, as being so different from the stolid indifference of ordinary savages. In colour, they vary from an olive brown to one approaching in depth that of the African negro. Evidently, in some of their tribes, the blood of the Papuan race has been mixed with that of the Malays. At the present time the Maori inhabitants of New Zealand are estimated to number a little over 60,000 souls, chiefly inhabiting the North Island, living together, in tribes, a settled life in villages. To a considerable extent, the Maoris have a capacity for continued exertion. They cultivate their fields, raise flocks and herds, sail coasting schooners, and labour in many ways, not only for a subsistence, but beyond this—for money with which to purchase luxuries and finery. It has long, however, been evident, even to themselves, that they are rapidly decreasing in numbers; and it requires no great sagacity to foresee that in a generation or two the race must become extinct. In character, it is admitted that the Maoris of New Zealand are the noblest of all the savage races with whom Europeans have come in contact. Manly, self-reliant, and truthful, they have shown in this war the virtues proper to a warlike independence in such a degree as to merit the praises of their panegyrists. The Maoris are now passing from barbarism to civilization; and the transition stage has brought with it to them evils neutralizing the good, or at least lessening it. European introduced diseases have had a baneful effect on their race; nor have individuals amongst them, brought into contact with that form of European civilization represented by runaway sailors, and others hanging loosely on to society, failed to acquire the vices of their teachers. In matters of food and dress, the Maoris, when in their villages, live very much as their ancestors did; but on their visits to the European settlements they conform generally to our customs in those matters. The reproach of cannibalism has now passed away. The present generation of Maoris are ashamed of their ancestors' taste in this matter, and are vexed when it is spoken of. At no time did the Maoris eat their fellow beings from hunger, as a regular matter of diet. Prisoners were killed after battle, and eaten in hideous festival, but only by warriors, apparently to satisfy a *ne plus ultra* feeling of fiendish hatred.

On the causes which led to this unhappy war between the colonists and the native inhabitants of New Zealand, it is not necessary to enter. It may be

necessary, however, to mention, as bearing somewhat on the present subject, that the Maoris had in their ranks the fighting strength of certain tribes entire—in this including very old men, and boys little more than children. Women even were with them, and seem to have taken an active part on some occasions; and six of them figure in our returns, most of them badly wounded. Other tribes which did not openly join the insurgent Maories, allowed the young men to join their forces, if so inclined. During the war it is known that fever (supposed to have been pythogenic) was very prevalent, both in their camps and amongst their tribes away from the seat of war.

When received into our field hospitals, the wounded Maoris had the same attention paid to them that was given to our own wounded; and as they had no prejudices about food or drink, their condition as hospital patients ought to have been about the same as our own soldiers—better, if anything, from belonging to, on the whole, a more temperate class. It turned out, however, that the Maoris suffering from injuries received in battle were very much less able to bear the strain on the system than soldiers. In marked contrast to the extremely favourable results obtained in our hospitals, in the cases of wounded soldiers, has been the unfavourable results of our treatment of wounded Maoris.

Records of the cases of 68 wounded Maoris have been kept, and of those men 31 died and 37 recovered. The mortality was thus at the rate of 45·58 per cent. of the admissions, whilst amongst the soldiers and officers, taken together, the mortality was at the rate of 19·26 per cent. of admissions. A good deal of this extra mortality may be explained by the fact that a large number of the Maoris were wounded in a much more serious way than many of the soldiers were. The wounded of the Maoris who fell into our hands were men incapable of following their retreating fellow countrymen. All the less seriously wounded escaped with *the* rest. The wounds inflicted by rifle bullets and fragments of shells may also have been more severe than those received by our troops. Something may be due to this, but not much. After all allowance has been made, the fact remains not much altered, that wounded Maoris die out of all proportion frequently to other men; and the true explanation would seem to lie in the mental condition of the prisoners. Keenly affected by the disgrace of capture, which, according to their notions, involves a perpetual loss of honour—a sort of civil death, in fact—this produces, at first, amongst them a despondency most injurious to wounded men, already lowered by the shock of gunshot wounds.

One peculiarity noticed amongst the wounded Maoris was their want of tolerance of the chloroform narcotism. The anæsthetic was administered to them at a risk. One man died apparently from it, whilst two others required vigorous and long-continued efforts of artificial respiration before they recovered from the effects of the inhalation.

The following Table exhibits a synopsis of the wounds of the Maori prisoners:—

Description of Injury.	Admitted.	Discharged.	Died.	Amputated.	Remarks.
Wounds of Viscera—					
Brain	3	..	3	..	
Lungs	7	1	6	..	
Abdominal ..	4	..	4	..	
Wounds of Spine ..	1	..	1	..	
Fractures of Bones—					
Humerus	3	3	..	1	In one man a false joint formed after fracture of humerus.
Radius	1	1	..	..
Femur	7	2	5	2	
Tibia and Fibula ..	6	4	2	4	
Bones of foot ..	1	1	..	..
Fracture of pelvis ..	1	..	1	..	
Bones of face ..	1	1	..	..
Wounds of Muscles ..	23	21	2	..	
Wounds of Joints—					
Shoulder-joint ..	2	..	2	1	
Elbow-joint ..	3	2	1	2	
Knee-joint ..	5	1	4	2	
Total	68	37	31	12	

Per-centage of Deaths to total Wounded treated 45·58.

a. One man after amputation of the arm died of Tetanus.

b. In one case of fracture of humerus, ligamentous union followed.